ELECTRICAL REVIEW

[ILLUSTRATED.]

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Edison's System of Electrical Distribution Based on Transformers.

The history of great advances in science shows that many individuals are in advance of the capability of the community to appreciate and profit by their discoveries. A single individual or a few pioneers, in advance of public expectation and belief, whose ideas were received with skepticism at the time they were announced, may now see them taken up in full confidence, and adopted with an "I told you so" that causes in the inventor's mind feelings of complete satisfaction, commingled with those of a distrust of the infallibility of human memory.

The past history of the ELECTRICAL REVIEW has proved its fearlessness and impartiality to all its readers. While it has not hesitated in the cause of truth to apply criticism's lash, it has been just as ready to commend true merit when found. The search for truth is always interesting, and the deeper the well at whose bottom it lies, the keener the satisfaction in grasping it.

The recent lively interest displayed in the distribution of electrical energy by inductive transformers, has called forth many conflicting statements, many encomiums of supposed originators, and many denunciations of claims to recognition made on behalf of various alleged inventors. It occurred to the REVIEW that here was a well that must have truth at its bottom, and we began to dig, and we now divide our "find" with our readers.

Down near the bottom of the well we find Gaulard & Gibbs—two earnest workers—chronicled as having brought out a system of distribution by transformers at London in the autumn of 1883. In this, and in other later installations by the same inventors, the transformers were arranged in series, and in all, self-regulation was found a serious obstacle, which was overcome finally by placing the inducing circuits of the various transformers in multiple arc in the circuit of the generator at the supply station.

But we find right at the bottom of the well the "hard pan" of several United States patents issued to Mr. T. A. Edison, and in order that readers may judge for themselves, we give the necessary data. The records which follow are published without prejudice or desire to reflect or commend, but only in the interest of the true history of electrical progress.

Applications were filed by and patents granted to Mr. Edison as follows, in the order of filing:

1. Electrical distribution system, No. 266,793; dated October 31, 1882; filed December 9, 1881.

2. Apparatus for the electrical transmission of power, No. 265,786; specification filed August 7, 1882; dated October 10, 1882. Consisting of rotating transformers in series and secondary circuits in multiple arc.

3. Apparatus for translating electric currents from high to low tension, No. 278,418; specification filed August 14, 1882; dated May 29, 1883. Induction coil apparatus, the primaries being in multiple arc, with constant potential direct-current mains, the secondary circuit being in multiple arc as usual.

4. System of electric distribution, No. 287,516; specification filed May 14, 1883; dated October 30, 1883. Rotating transformers in multiple arc, with the source of electric current.

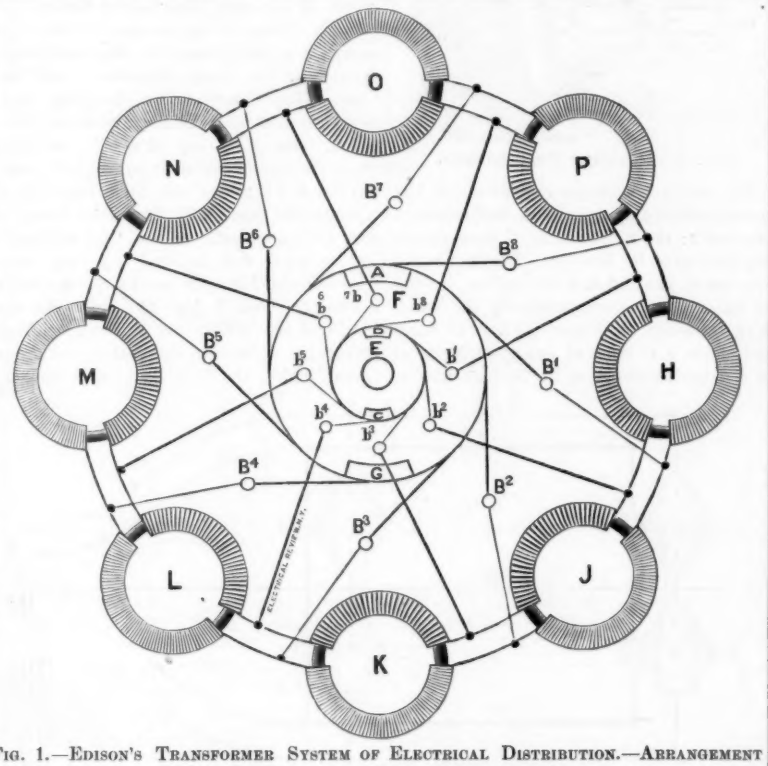

FIG. 1.—EDISON'S TRANSFORMER SYSTEM OF ELECTRICAL DISTRIBUTION.—ARRANGEMENT OF INDUCTION COILS AND COMMUTATING ALTERNATOR.

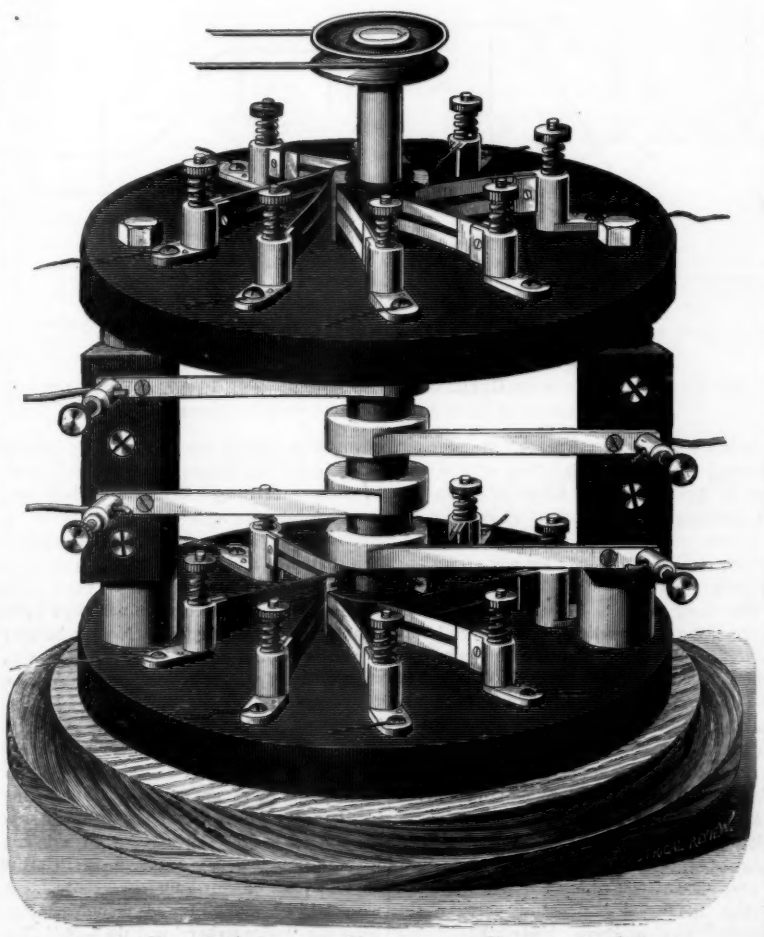

FIG. 2.—EDISON'S ALTERNATOR USED WITH HIS TRANSFORMER SYSTEM.

The patents above noted give a very full description of all the main features of the methods of distributing electrical energy as now practiced, and after a careful reading of them it really seems only just to conclude that, as far as published records show, Mr. Edison is entitled to the honor of having been the first to comprehensively realize the importance of inductive distribution, and to devise, so far in advance, forms and methods whose practice and fulfillment the false prophets and skeptics of the hour forbade.

In our investigations we naturally felt curious to know what had been done by Mr. Edison towards the practical development of the inventions above noted. We find, practically, no change, merely a touch here and there as to mechanical details to fit the gauges of later refinement, and dress the child of 1881 in the fashion of 1887. And we present to our readers a description and figures by which will be seen the very full extent that the "motor generator," so-called, of the original conceptions of Edison, goes into the field of economy.

In the interesting illustrations presented herewith, Fig. 1 is a diagram representing the disposition of induction coils connected with the rotating alternating device of which Fig. 2 is a drawing.

The induction coils *H, J, K, L, M, N, O, P*, are built up of a core of laminated iron on which are wound two coils of copper, one of coarse wire as shown by the heavy lines for the secondary circuit, the other of fine wire for the primary circuit. The primary coils are connected, as also are the secondary. From each connecting wire are attached brushes B^1, B^2, etc., for the primary, b^1 b^2, etc., for the secondary circuit. *E* and *F* are on the same shaft and in a portion of their circumferences are inserted metallic contact pieces *A, D, C, G*. *A* and *G* are joined with two continuous rings on which press brushes connected with the dynamo circuit. As the shaft revolves, brushes B^7, b^7, and B^8, b^8 will touch the metal sections *A, D, C, G*. The direction of the current will therefore be reversed in the primary coils of *O* and *K* and induced currents generated in the secondaries of the same coils, which will be taken off by the brushes b^7, b^8, conveyed to two rings and thence by brushes to the local lamp or motor circuit. As the rotation continues the current in the primaries of the coils is in succession reversed and the induced current in the secondaries commutated. The transformers are connected in multiple arc with the dynamo circuit as shown, by the patent No. 278, 418, May 29, 1883, a series system being extremely difficult of regulation. They may be described as a lot of closed magnetic converters arranged in a crown constituting a compound alternating and converting device, the commutation being obtained practically as in the coils of a Gramme ring. According to the ratio of the number of turns on the primaries and secondaries, the electromotive force can be raised or lowered. For long distance transmission, using a continuous current of

high tension, small conductors only are needed. This current is converted into a continuous current of low tension for incandescent lamp or motor circuits. Reversals of the current are made so rapidly (100–200 per second) that the iron cores are never fully magnetized and the percentage of conversion is remarkably high. If the primary coils be supplied with current of constant potential the apparatus is self-regulating and the slight variation of the potential of the secondary circuit is due to the resistance of the wires. Less than the energy of one 16 candle power lamp is required to operate a motor driving the rotating shaft to commutate current of 200 amperes.

Fig. 3 represents a modification of this device. The primary and secondary coils are wound upon one iron core precisely as in a Gramme ring. Outside the whole is a mass of laminated iron, which is stationary, to concentrate the lines of force upon the copper wire. The primary coils of fine wire are connected with the commutator at the end of the shaft, and secondary coils of coarse wire with the remaining commutator.

The coils and shaft revolve. Brushes convey current to the primary coils, the current being reversed in each coil twice each revolution. The reversals of the induced currents in the secondary coils, occurring at the instant the coil passes from left to right hand side, as in a Gramme ring. The above device was patented on May 29, 1883, No. 274,418.

Mr. Edison's United States patent 265,786, dated Oct. 10, 1882, describes a system for the distribution of electrical energy in which one set of armature coils of a number of the rotating transformers are connected in series with the dynamo supplying the current In the secondary circuits of the transformers are placed incandescent lamps or other apparatus. By this system the expense for conductors on long circuits is materially reduced over that of low tension multiple arc distribution. Owing to the difficulties of regulation, Mr. Edison patented Oct. 30, 1883, No. 287,516, a system of electric distribution consisting of motor generators or transformers, the primary circuits of which were connected in multiple arc with the dynamo circuit as shown in the diagram, Fig. 4.

Dynamos *D, D, D, D,* connected as usual in the three-wire system, are wound to generate currents of high electromotive force, admitting of the employment of small conductors. The three wires *F, E, N,* are connected at the sub-station with the primary circuits of the armature of the converters or transformers. The current for the field magnets of the dynamos passes through the wires *B, B,* the rheostats *R, R,* which are at the sub-station, returning over the neutral wire *N.* The wires *B* are very small, preferably of iron for economy, and the slight loss of energy in them is of no consequence compared with the convenience of regulating from the sub-station the potential of the current supplied to the converters. The three-wire system is advantageous because the insulation of dynamos and converters will be subjected to one-half the potential of a two-wire system, and because the distribution from the sub-station is easily made on the three-wire system, and economy of conductors and increased area of distribution obtained.

The current is collected from the commutators *S, S,* of the secondary coils of the converters, and is distributed exactly as if the armatures of the converters were driven by an engine instead of a current of electricity from a distant source.

From the indications of the ammeters *A* and voltmeters attached to pressure wires leading from desirable points on the distributing mains, the attendant at the sub-station regulates the potential of the distributing mains *M* by the feeder regulators *G,* and the rheostats *R.* By the use of the latter it is unnecessary to run back pressure wires from the sub-station to the dynamo station.

Transformers or motor generators look like dynamos. The armatures are wound with two sets of coils, large and small. As their name indicates, they are electric motors, the converting armatures revolving in a powerful field, by the influence of the current passing through their primary circuits. This disposition proves a potent factor in the economy of the system. As there is no belt strain, well balanced armatures are run at double the speed of a dynamo of the same size. The output is therefore twice that of a dynamo of the same size. At an outlay of 50 per cent. of the cost of the dynamos of the central station, converters can be placed in a sub-station and current distributed four miles instead of less than a mile from the power plant, and at no greater expense for conductors.

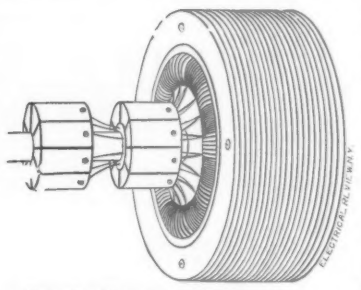

FIG. 3.—ROTATING TRANSFORMER.

The motor generators require much less attention than a dynamo with well-balanced armatures; the weight alone of these causes any friction on the bearings. The number of amperes of the high and low tension circuits of the armature is approximately the same. Any tendency to distort the lines of force and cause a rotation of non-sparking point in a negative direction by the high tension or motor coils is neutralized by the current (flowing in opposite direction) of low tension or dynamo coils. There is absolutely no sparking at the brushes of either commutator, and the brushes, when once adjusted, require no change for any variations of load.

The field magnets for transformers are inexpensive. A 100 light induction coil converter costing $200 for alternating currents, when placed in a field costing $100 and used as a dynamo converter, will run 1,000 lights, and the output is limited only by Foucault currents.

As a complete exposition of the principles embodied in the foregoing patents, a station is in process of construction at Llewellyn Park, one of the most beautiful suburbs of New York.

Dynamos of 600 volts each will be used, giving 1,200 volts' pressure between the positive and negative leads. From the sub-stations lamps and motors suited to 100 and 220 volt circuits will be supplied with a uniform current at constant potential, which can be as easily metered as in systems in which the current is distributed directly from the dynamos. The plant will be installed in Mr. Edison's new laboratory, which will undoubtedly be, when completed, the most extensive electrical laboratory in the world, where the distinguished inventor, with his talented associate, Mr. E. T. Gilliland, will prosecute experiments in electrical work. Underground cables are to connect with sub-stations at "Glenmont," the inventor's residence, 400 lights, and with several residences in the vicinity. A converter will be placed in each house.

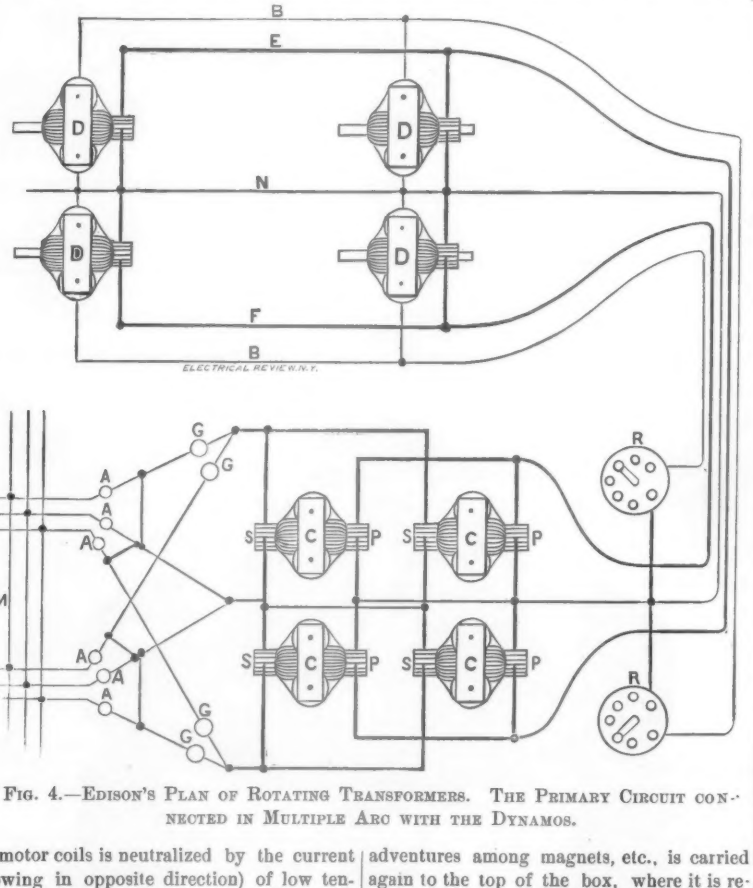

FIG. 4.—EDISON'S PLAN OF ROTATING TRANSFORMERS. THE PRIMARY CIRCUIT CONNECTED IN MULTIPLE ARC WITH THE DYNAMOS.

Writing by Electricity over a Circuit Fifty Miles Long.

One of the most beautiful of modern inventions—it remains to be seen whether it is as useful as it is beautiful—the instrument devised by Mr. John Robertson, for the transmission of writing by electricity, may now be seen at work at the American exhibition. Out of the top of a box, which is about the size of an ordinary dispatch box, protrudes what has the appearance of a stylographic pen. This, however, is not a pen, but the handle of the "transmitter," and its lower end is fixed to a light brass perpendicular bar. Any motion given by the hand—you hold it just like a pen—to the handle of the transmitter is communicated by this bar to two series of carbon disks contained within the box, and, after various adventures among magnets, etc., is carried again to the top of the box, where it is reproduced exactly by a small ink-holding pen, whose point rests on a white paper tape. A clockwork apparatus pulls this tape along at a gentle pace; and after a little practice you find that it is quite easy to move the handle of the transmitter so that the pen shall write legibly on the moving tape. Now, whatever is written on the tape before you is written simultaneously a mile off, or it may be fifty miles off, on a similar tape, by a similar instrument at the other end of the wire. The instrument is very compact, and apparently efficient; and, as it is quite silent, there seems no reason why a reporter sitting in the House of Commons should not straightway write off his report of a debate to be instantaneously read off in Printing House square or Northumberland street. A name will be wanted for his machine. Perhaps the "wire writer" will do.—*Pall Mall Gazette.*

A New Form of Secondary Battery.

BY KILLINGWORTH HEDGES.

Secondary batteries or accumulators may be said to have become a necessity in private installations of the electric light, and to be as far advanced as any other part of the lighting system. The batteries which are best known are widely different from those designed by the original inventor, M. Gustave Planté, very little a tention having been paid to this type until the matter was taken in hand by a French engineer, M Phillimond Bailly, whose invention I shall have the honor of describing to you to-day. The battery, which has been termed the Phœnix, is of two kinds, Pb Pb, or lead lead, and Pb-Zn or lead zinc, and it is to the latter to which I will confine my remarks. The idea of using zinc for the cathode or positive plate of a secondary battery is not new in principle, having been described by several inventors, but its adoption for commercial work was not practicable until about a year ago, when M. Bailly introduced this battery in several installations abroad, where they are still employed. M. Reynier had previously designed a battery with a lead or copper plate coated with zinc, but it failed, and long before this Mr. Swinburne tried a similar plan, employing oxide or carbonate of zinc; but both these arrangements were far more expensive than that of M. Bailly, who prepares his zincs by moulding zinc filings with mercury, and compressing it into a rod or plate.

In a lead zinc battery the action is as follows: The zinc plate is attacked by the sulphuric acid in the presence of the peroxide of lead, the latter acting as a perfect depolarizer; consequently the reaction is much more energetic than in a lead-lead battery, and the available E M.F. is, in fact, 2.5 volts, falling to 2 33 when current is taken out. A lead-zinc accumulator is, in fact, a perfect primary battery, in addition to having a large storage capacity, which M Bailly has found to be five times as much as a lead-lead battery with plates of similar surface. In discharging the zinc plate dissolves in the dilute acid, forming sulphate of zinc, which is decomposed on recharging, pure metallic zinc being deposited on the zinc plate. The zinc, if properly amalgamated, is thus never consumed, but only dissolved and re-deposited. I have on the table some zinc plates which have been used in a small portable battery which I have used nearly every evening for the past four months, and they are still quite fit for work, although they are simple strips of commercial zinc, and not made on M. Bailly's plan of moulded filings. If the latter is employed I do not see why the zinc plate should not last as long as the peroxide plate. The lead plates of the Planté cell were simple sheets of rolled-up lead, and had very little capacity. In the Phœnix battery they are formed of a quantity of fine shreds termed "lead wool," which are interwoven among a number of strips or fringes cut out of a lead plate, so as to form a sort of basket work, which is submitted to pressure, and then placed in the space left between a porous pot and the outside receptacle. The object has been to have a solid metallic conductor permeating the whole mass of the lead wool, so as to pick up the current with a minimum loss due to internal resistance, which has been the cause of failure of those Planté batteries in which lead wool or spongy lead was employed. M. Bailly compares his mode of picking up the current to the "venous system of the human body," in that the main conductor or artery spreads out in every direction much in the same manner as the veins in the body. The capacity of lead plates constructed in this manner is very large, the lead wool giving a surface of 1.5 square meter per kilogramme of lead; every part of the mass is permeated by the fringe-like extensions of the conductor, which, being of much larger section than the lead wool filaments, remain firm and solid when the latter are completely peroxidized.

Lead-zinc batteries may be constructed in various forms; a convenient arrangement is

the circular form, which I designed with a view to strength and portability.

The zinc plate is contained in a circular porous pot, conical at the bottom so as to economize the mercury, which forms an excellent electrical connection between the copper conductors and the zinc, without the use of a soldered joint, and admits of the speedy removal of the zinc plate. In larger cells a flat zinc electrode is used, and is contained between two porous plates which are made of compressed sand and offer very little resistance to the current, because they are honeycombed in every direction, and are, in fact, too porous for primary batteries.

The outside case is made of celluloid, a material which is extremely useful for electrical purposes, in that it is unaffected by acid and can be readily moulded into any required shape; also it is much lighter than any other suitable material. For small cells I usually protect the cellulcid by a wickerwork covering, but in the larger kind, when they have to be removed for charging, a very light and strong receptacle is made by placing the celluloid in a loose fitting wooden box, and running an insulating material between the two, which effectually takes off any jar that might injure the interior cell. I have found that the most suitable material is a compound known as Phœnix varnish, in that it is almost as cheap as pitch and does not shrink or crack at a low temperature.

A disadvantage attending the use of a lead-zinc battery has been often quoted, namely, that there is a greater fall of electromotive force than with a lead-lead couple. This is not a serious objection, even for lighting purposes, if the discharge is not pushed too rapidly; for driving motors, electrical welding, and other new methods to which secondary batteries may be applied, a fall of electromotive force is of little consequence, and is more than compensated for by the gain of nearly 25 per cent. in the E.M.F. M. Bailly states that he has obtained an output of nearly five times as much from a lead-zinc battery of similar surface to a lead-lead without lowering the E.M.F. below two volts; he has also obtained 28 ampere hours per kilogramme of peroxidized plate, or 0.08 pound per ampere hour. In practice I have not obtained so good a result, the average output being 0.13 pound per ampere hour, which, however, compares very favorably with other batteries.

In the early days of accumulators it was seriously proposed to distribute electricity by their use in the same manner as milk. The all-important factor of the difference in weight of the empty milk cans—as compared with the empty batteries—was apparently forgotten, and the public quickly found this out, although there is a story that a railway company were satisfied with the statement that a set of batteries were empty, and therefore charged the carriage at the returned empty rate. It would not, however, be impracticable for a few people living in the same neighborhood to arrange to take a supply of electricity for lighting their principal rooms, as a small set of batteries on the plan I have here could be easily delivered.

This basket contains six cells or bottles, the total weight being under 1 cwt., so that the whole can be carried by one man. The capacity of each cell is 60 ampere hours, and a sufficient number of lamps can be maintained to light a dinner table.

There is a great want at the present time for a small portable battery for railway carriage lighting, to be used as a reservoir for maintaining the lamps when the carriages are uncoupled for the purpose of making up the train. The successful illumination of railway trains by electricity has been practically demonstrated by the northwestern and other companies, who have had trains electrically lighted for some years. The plan which appears to give the best results is to fix a small dynamo and high speed engine either on the locomotive or back of the tender, giving the driver control of the apparatus, so that he can readily start it from the foot plate. The only objection has been the impossibility of disconnecting the carriages without extinguishing the light. A battery on the plan I have described would not occupy more space than the receiver which is usually employed with the oil gas system, and would be far safer in every way.

The immunity from accident on our well-managed railways is probably the reason that some fearful disaster has not before this attended the use of compressed gas.

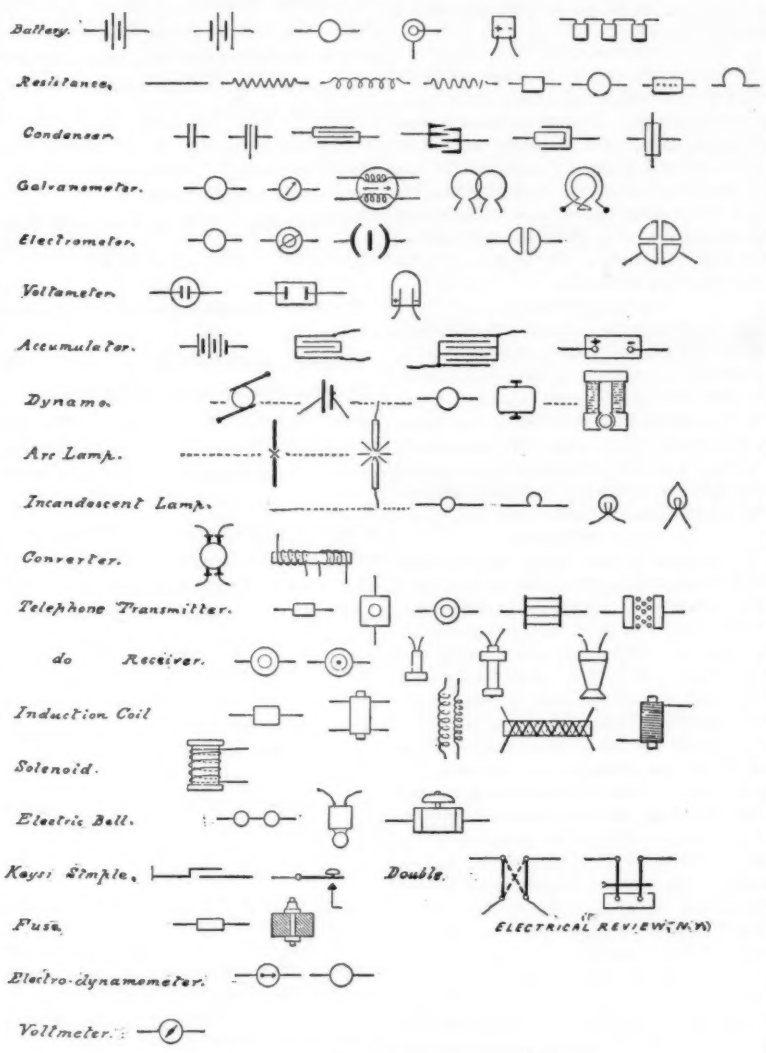

PLATE 1.—SYMBOLS OF ELECTRICAL APPARATUS.

Railway passengers are ignorant of the dangerous nature of the illuminant, which is generally stored in steel cylinders under the carriages, although these cylinders are amply strong enough to resist the enormous pressure of the gas, but would be easily perforated in the event of a collision, with the result that the liberated gas mixing with air would either explode or in all human probability cause a dangerous fire.

If such an accident occurred in a tunnel—for instance, on the Underground Railway, where the system is generally adopted—there is the additional danger of suffocation from the escaping gas, which would occupy a very large volume of space. An accident took place quite recently on the Berlin Potsdam Railway which ought to act as a warning. An empty goods train ran into a passenger train, piercing the gas cylinder. The liberated gas, being set on fire by the goods engine, flew about in all directions, setting fire to everything in the carriage, in which there were three persons, who, before they could escape, were burnt to cinder. It is stated in the official account that the only remnant of the male passenger was "the buttons on his waistcoat." The gas receiver was a long sheet iron drum placed transversely under a second class carriage.

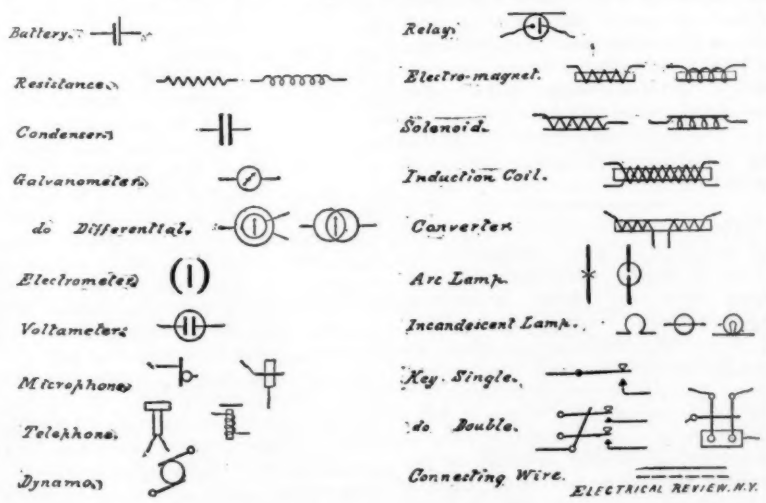

PLATE 2. —MUNRO'S TABLE OF SYMBOLS.

It is needless to say that with electric ligh no such accident could happen, and as the employment of the compressed gas appears to offer the chance of either "cremation or suffocation," it would be far better for the railway companies to improve their existing oil lamp system until they can see their way to universally adopt the electric light.

—— The city council of Sandusky is considering the abolishing of gas and introduction of electricity for street lighting.

Graphic Symbols for Electrical Apparatus.

In an interesting article in *La Lumière Electrique*, J. Munro presents some considerations that should be borne in mind by all who attempt to describe electrical apparatus, and recognizing the great importance now-a-days of graphic symbols, he has collected a considerable number of these which he finds in current use. These are reproduced here. It is evident that the same symbol is used to represent very different things. The author therefore has drawn up a shorter table, shown in Fig. 2, containing the symbols from those longer tables which he considers the best, and has added a few others not yet commonly used. It may be remembered that a committee of the Society of Telegraph Engineers and Electricians is engaged with this question, and will doubtless soon present a report on the subject. Meantime the present paper will prove useful, and will, we trust, lead to greater uniformity in the use of symbols.

Notes Translated from Foreign Journals.

PATENTS IN SWITZERLAND.—The Swiss people have voted, by a majority of 133,000 out of 245 000 votes, to introduce into the Federal Constitution a clause giving the authorities the right to grant protection to industrial inventions. Holland is now the only country which does not guarantee to inventors the property in their own ideas.

GAS FOR MOTORS IN THEATERS.—In Paris the authorities are considering the question of allowing the use of gas motors in theaters to drive dynamos for the production of electric lights. It is recognized that electric lights will surely drive gas out of places of amusement, accordingly the gas company has asked to be authorized to reduce by one-half the price of the gas used for motors in the Theatre Francais and the Theatre de l'Odeon. It is estimated that the gas costs 4 centimes per cubic meter, and the reduced price would be 15 centimes per cubic meter (about 70 cents per thousand feet). We shall watch with interest to see whether this method of lighting is finally adopted, or whether central stations are built outside of the theaters.

AUTOMATIC REGULATION OF STEAM OR GAS ENGINES.—M. Menges has added another to the rapidly growing list of regulators depending for their action upon a solenoid around which a current flows. By suitable mechanism the varying attraction of the core of this solenoid is caused to act upon the supply of steam or gas. Experiments made in Paris, upon a compound wound Gramme dynamo taking about eight horse power, showed no appreciable changes in velocity; while with a shunt wound dynamo the difference of potential when the current varied from 0 to 35 amperes did not vary more than 1 per cent.—*Bulletin International de l'Electricité.*

COST OF ARC LIGHTING IN AUSTRIA.—It may interest some readers to compare the prices for electric lighting in Salzbourg with American prices.

Sixteen candle power lamps cost 2 cents per hour, with discount up to 25 per cent., according to the number of hours burned.

For arc lamps the rates are as follows (possibly the last item is misprinted):

6 cents per hour for 400 to 500 candle power lamps.
9 cents per hour for 600 to 700 candle power lamps.
11 cents per hour for 800 to 900 candle power lamps.
9 cents per hour for 1,400 to 1,600 candle power lamps.

Electric meters are furnished after testing by an officer appointed by the municipality. These meters are rented at a yearly charge of from $7.00 to $18.00, according to the number of lamps.—*Electricité.*

** Ausonia, Conn., expects to have its electric road, overhead wire system, running inside of two weeks.

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We are promised some "s artling revelations" in electric lighting shortly, and from a new source.

The scientific world will now be on the *qui vive* for the *denouement* of the "mystery," announced in another column. It cannot be perpetual motion, for Edison is a skeptic on that score. Our columns are free to inventors or friends of inventors who have struck the same thing!

In Cincinnati, on the 14th inst., the city solicitor rendered a decision that the city council has no power to pass an ordinance compelling telegraph and telephone companies to put their wires underground, for the reason that their rights are derived from the State law. This would seem to summarily end the project of burying the wires in that city, and will have a tendency to similarly affect the work elsewhere.

The reports on the success of Prof. Paine's electric submarine boat at Havre, if true, herald a great advance in storage batteries, and we await fuller details and data.

Compared with the work of the batteries on the electric yacht Volta, Prof. Paine shows a storage capacity per horse power output with eighty per cent. less weight of battery. This seems almost too good to be true.

It would be a good thing for the more rapid advancement of incandescent lighting, if the architects of buildings and the contractors would realize that good wiring is as important as good workmanship in the dynamo and lamps. It is too much to expect plumbers, steam-fitters, and carpenters to be versed in the intricacies of wiring and insulation, and nobody should be surprised at the failure of an installation where the wiring has been carelessly sub-let to such hands. No owner of a new building would permit his steam-fitting to be let to an upholsterer, nor his cabinet work to a bricklayer; and he should be just as cautious about his electric light wiring contract. "Every man to his trade" says the proverb, and it is nowhere more applicable than in electric lighting.

A street car propelled by electricity attracted much attention on Fourth avenue, this city, last week. It was a new car, expressly built for use in Boston, and was run as a test of the Sprague electric motor, with Julien storage batteries. Hidden away under the car were two motors, and concealed under the seats were the accumulators. The storage battery weighed 3,600 pounds and the motors 1,400 pounds, and the electric people said that these would run the car thirty miles, or for four hours, and develop fifteen horse power. The car ran smoothly and was easily controlled. With fifteen men on board it easily climbed the steep grades on the road, and it was stopped and started on curves and grades without trouble. The brushes on one of the motors burnt out, and that motor was disconnected, and the car run in with the other one.

"The man who is his own lawyer has a fool for a client." Those successful in one branch of business often think that their sagacity and good judgment acquired by experience enable them to judge accurately of problems which are technical and scientific rather than commercial. Lawyers, doctors, business men, at times invest their money in enterprises, the success of which depends upon some alleged discovery or invention. Occasionally an expert is consulted by an investor; oftener the hopes or claims of the experimenter and his friends are taken as accomplished facts. On the failure of the scheme, inventors and projectors are condemned in a wholesale manner for the shortcomings of a few. The primary battery for incandescent lighting has recently in England been made the basis of many published stockjobbing schemes. This country is not far behind, and intending investors would do well to pause before placing their money in schemes of which the only merit is the glowing and indefinite descriptions given by the projectors.

BELL WINS.

Judge Colt, of the First Circuit, in Boston, last Monday dismissed the famous case brought by the Government against the Bell Telephone Company, on the ground that the Attorney-General has no authority and no power to bring any such suit. This leaves the opposing telephone claimants in a sorry plight. The owners of the Bell patents have been victorious in every case, and now comes this decisive action on the part of the U. S. Circuit Court, which will probably put an end to telephone litigation. If the Government so decides, an appeal can be taken to the Supreme Court at Washington.

This decision will be received with satisfaction by the substantial telephone interests of the country.

We do not think this case will ever be heard from again.

Its history is worth recalling. In Ohio, the Circuit Court threw it out, on the ground that the Attorney-General had no authority and no power to bring such a suit in that circuit because the defendant did not reside there and could not be sued there. Then the Attorney-General went to Massachusetts, where the Bell Company had its principal office. A large array of eminent counsel was employed at the expense of the Treasury, who argued the case on the part of the administration, and Messrs. Dickerson, of New York, and Storrow, of Boston, were heard on the part of the Bell patent; and now the decision of the court is that the Attorney-General cannot bring such a suit anywhere! Thus it is determined that the peculiar scheme to set aside and annul the Bell patent has no law and no reason to support it, and is entirely illegal and unjustifiable.

The New York *Sun* says: "This is the conclusion that we have expected ever since this unfortunate and discreditable business was planned. The prosecution, begun through a combination of the Pan-Electric speculators with other loose fish who pretended to have rights in the telephone, and pursued by the Federal Administration with all the weight of the President and Treasury to back it up, has now finally ended in nothing but shame for its authors."

EDISON'S MYSTERY.

A representative of the REVIEW casually met Mr. Edison this week, and he happened to be in more than his usually jolly mood—and by the way he is apparently in the ruddiest health and best of spirits. To the inquiry if he had anything new Mr. Edison replied: "Yes, I have made a fresh discovery of no little importance—a great advance in electric art—tested its practicability and realized success; but I will not name it now. Heretofore when I have invented or discovered something and published its details, the scientific papers have soon after teemed with announcements of anticipations, prior experiments, hints about piracy and stolen thunder, etc. According to these I have never produced a prototype, nothing but poor, miserable little antitypes. Now, this time I'm going to have some fun with the boys. My new discovery is fully recorded, *but I will not publish it for six months!* You may give this formal notice, so that the bibliophiles and prior inventors may have the first chance, with lots of time to get the laugh on me. As the oil men say, I'm down to the 'oil sand,' but propose to plug the well and hold it as a 'mystery' for six months. If, meantime, no claimant appears with a full description of the 'mystery,' I'll draw the plug, and I think I'll be entitled to nail my sign on that property."

The next telephone convention will be held in New York—a wise decision on the part of the members. The Electric Club has tendered the telephone men free use of its assembly room, which will be an admirable place for holding the convention.

THE USES OF INDUCTION.

Our article in this issue on the history of distribution by converters or transformers will be deeply interesting to the readers of the REVIEW, we have no doubt. It does really seem that the history of the development of electric lighting, to be complete, must draw largely on the literature found in Edison's patents. And it looks as if his prevision of the future, now the living present, had been most complete, amounting almost to an extraordinary comprehension of the capabilities of the electric current and the means of mastery thereof. He certainly fully realized in 1882 the advantages of conversion by induction, and was led to the practical possibilities no doubt by his experience in devising systems of telegraphy, particularly those involving the use of powerful currents. It is a strange reflection that induction, while a bitter foe to the telegraph and telephone, promises to be the electric light's best friend.

THE TELEPHONE WORKERS.

That there is great improvement still being made in telephone apparatus and methods, a careful reading of the proceedings of the National Telephone Exchange Association at the Pittsburgh convention, this week, will disclose. The domain of the telephone is ever extending, and the successful work in long distance service, so clearly shown in the paper of General Manager Hall, goes to prove, as is stated, that "the progress of electrical development will keep the possible limit up to the distance over which it will be commercially profitable to supply this service." This particular paper will be of much interest, coming as it does from a practical and earnest worker in this new field of the telephone.

The standing of the telephone in the commercial world having been established long since, the task now presenting itself to the gentlemen whose interests are centered in it would seem to be that of improving exchange facilities, both with an eye to economy and to efficiency. Metallic circuits, though only as yet figuring in the dreams of the telephone promotors, should now be taken into consideration, and wherever an exchange is to be reconstructed, should be counted in along with the multiple switchboard and the many little electrical details that the progressive telephone exchange builder is able to adapt to his use. And it is at conventions similar to the one just held in Pittsburgh that these little details can be announced so as to benefit the telephone men of the country, and increase the demand in every city. The old theory, and at one time a true one, that to increase the number of subscribers above a given number lessened the percentage of gain, it is now time to discard and give place to the modern idea that everyone who is willing to pay for a telephone shall have it, have it promptly, and the good service that can and should go with it. We are well aware of the many intricacies connected with telephone work which compel all improvements and changes to move slowly, but now that the reconstruction period may be said to be upon us again, every advantage of past experience and undisputed electrical information should be taken, and if the outlay at first blush seems too great, we are convinced the increase in subscribers will rapidly make amends.

Is it not a live question for telephone men to consider that there is not an exchange in this country that begins to compare in its service with that of the telephone lines 100 miles long extending between New York and Philadelphia? And this same excellent service will soon be recorded, we doubt not, on the system now being built between New York and Boston and Albany.

The underground question is one that still is beset with grave problems. The history of the work in Chicago and in Brooklyn is clearly presented in the papers by Mr. Sunny and Mr. Sargent respectively. Mr. Sunny treats the question of insulation at some length, and his experience and views will be found of much practical value.

President C. N. Fay, in his usual vigorous and forcible way, recounted the history of the onslaught on the telephone by municipalities and would-be law-makers, and calls attention to the many unfortunate results which follow.

OUR CHICAGO LETTER.

(From a special correspondent of the ELECTRICAL REVIEW.)

The Badger Illuminating Company, of Milwaukee, having tried for a series of years to do business with a cheap quality of wire, have at last pulled out their first efforts and re-run their lines. The company has started in again and is now running ninety lights satisfactorily.

The Minnesota Brush Company at Minneapolis has now 1,100 arc lights, and on circuits with these, has 250 incandescent lamps, Brush distribution system. It is also running on arc wires from its new station, where a 275 horse power Corliss engine is doing the work, several Brush motors, as witness:

Three 14 horse power, two 2 horse power, and two of 1 horse power, driving three printing presses, one fan, an elevator, and a laundry. Mr. A. S. Huey, of the Edison, has just moved into his new office, which is said to be more attractive than a policeman's new coat or a club oarsman's shirt. Huey has recently placed 800 lights in the People's Theater; 400 in the State Public School at Owatonna, 100 in the Nelson Tenny Company saw mill, 150 in the Minnesota Strawboard Mill, 250 in the St. Mary's School at Faribault, and 50 in the Eisenbusch Brewery. There is talk of a huge central station incandescent plant soon to be settled upon, but there is some mystery about it, which time alone can solve.

The St. Paul Gas Company talks of adopting an alternate system of incandescent lighting, and say that they purpose making somebody dance to their music. The company is now running the United States long-distance system to the tune of about 1,500 lights, and giving perfect satisfaction.

At the last meeting of the Electric Club, Mr. Frank J. Sprague and Mr. McL. Harding, general agent for the Sprague Company, who were on their way through the city, spent the evening with us. Mr. Sprague, while declining to make any very extended remarks, did mingle in the discussion of Mr. Sperry's paper.

The Sprague people, represented by Mr. C. M. Barclay, Western agent at Chicago, are doing a quite lively business. Mr. B. reports recent installations as follows: Elgin, Ill., three one-half horse power motors; La Crosse, Wis., two one-half horse power; St. Paul, Minn., three one horse power; Peoria, Ill., two five horse power motors, one in *The Democrat and Post Review*, and one in the Hill Publishing Company's establishment.

In Chicago, Mr. B. has placed in each of the following places a one-horse motor: At Myer & Goodman's, at Lansing and Sickler's, and at the American Exchange National Bank, for ventilation—in the latter case running a thirty inch fan. In the Fair, on Dearborn street, one of these machines is grinding away, doing its level best to keep up with the demands of coffee purchasers.

At the meeting of the club on the 19th inst., Mr. C. A. Brown, V. P., in the chair, a manifest increasing interest in the club and its growth was evinced by the large attendance. The room was full, and the discussions were very general. A committee consisting of W. J. Buckley, of the Fort Wayne Jenny; W. A. Stiles, of the Vandepoele, and C. D. Shain, of the U. S., was appointed by the chair on the subject of better rooms. This committee has subsequently selected, and the managers have decided to accept the room on the second floor of the southwest corner of Calhoun place and Clark street. The rooms will consist of one suite of three, about twenty feet square, which will be separated by folding doors or curtains, so that one large room for lecture purposes will be available at any time, sixty feet in length. The rear room, in addition, will be used as a library and as an office, by some party who will occupy the premises as a sort of custodian of the property and host to strangers and visitors.

Mr. E. A. Sperry read a paper on Protection of Dynamos from Lightning. The discussion brought out some curious facts relative to discharges of static electricity, and where these go to. Mr. E. P. Warner related a case where the ground plate of a lightning arrester, with an insulation from ground of 500 ohms, did just as well, apparently, as if it had been properly connected; and several instances were mentioned where the last trace of a discharge was found where the field wire was soldered, or welded, to the core. Prying this loose, the machine was all right again. In cases where the discharge took this form, little, if any, damage was done elsewhere.

Prof. Badt, gave, apropos of the discussion of ground plates, etc., some interesting information on the subject of lightning rods and lightning dangers in Europe, as embodied in recent reports from commissions appointed to investigate lightning and its effects.

Mr. Sunny, superintendent of the Chicago Telephone Company, confirmed the statements made by other telephone men, that with an increase of telephone wires there was a constant decrease of trouble from atmospheric electricity.

Mr. Leonard stated that at Appleton, Wisconsin, one of the oldest inhabitants complained that since the Edison people had run so much wire around the city, the locality was losing its reputation as a thunder-storm center. This, it may be remarked, by the way, is one more advantage—one more argument in favor of electric lighting. It makes peace even among the elements.

The Western Electric Company has recently closed a contract for a twenty light arc plant for the Chicago City Railway Company's new power station at 55th street and Cottage Grove avenue. In addition to the arc lights, several individual Little-McDonald cut-outs with incandescent lamps will be placed.

CHICAGO, Sept. 26.

OUR BOSTON LETTER.

(From a special correspondent of the ELECTRICAL REVIEW.)

The second regular meeting of the Boston Electric Club was held on Thursday evening, Sept. 22. Although no refreshments or entertainment of any kind were provided, there was a large attendance, the handsome reception rooms being comfortably filled. President Ridlon presided. After usual routine business a number of interesting matters were discussed relative to the policy of the club. Reports by secretary and treasurer were rendered, showing that the membership list was rapidly increasing, and that fees and dues were being paid as soon as could be expected. Mr. A. H. Chapman, chairman of Committee on Revision of Constitution, presented an elaborate report, which met with the unanimous approval of the club. These constitutional changes, which will come into effect January next, are quite comprehensive, and will throw the management of the club more directly upon its members, giving the power of election to each individual, and not, as heretofore, confine it to the Board of Management. Mr. P. H. Alexander, Chairman of the House Committee, informally reported that he was meeting a most cordial response to his call for donations, many handsome articles of furniture having been already received and the nucleus of a library having already been laid by the donation of several valuable and rare works of electrical interest. A handsome proposition from the Boston Electric Lighting Company, for furnishing the current for properly illuminating the club house was read by the secretary and unanimously accepted with thanks. A pleasant feature of the evening was the impromptu rendering of a few four part songs by the Glee Club (H. H. Eustis, leader), which, although not yet fully organized, shows promise of future usefulness. Many gentlemen were called to the floor and expressed themselves freely in regard to the future work of the club, which it is probable will take more than the social interest, several scientists committing themselves to the belief that in time the club would be the tribune upon which electrical matters in New England would be discussed with a broad and disinterested purpose.

The Gas Commissioners gave hearings last week to the gas companies of Clinton, Chelsea, and New Bedford. In the latter place it is desired to purchase the existing arc light plant. The other places ask for the authority to operate plants of their own. The Chelsea Company also desires the right to operate electric lights in Revere. Attempts have been made to convince the Gas Commissioners that coke and coke screenings were useless as fuel for steam plants. However, testimony regarding the plants of gas companies at Charlestown, Brookline, Burlington, Vt., and Schenectady, N. Y., showed that by the use of the Jarvis furnace in those places mentioned, excellent results were obtained by using these fuels (coke and coke screenings) wet. The cost to gas companies, as these are to a great extent useless for any other purpose, is extremely small.

The Knight-Bentley surface street railway, at Woonsocket, R. I., is, for a part of the contemplated distance, being pushed to completion. Ultimately ten miles of track will be laid, of which four are completed with overhead conductors. The road will run to the suburbs and Manville. The rolling stock comprises nine cars, each fitted with a 15 horse power Thomson-Houston special motor. The power plant was built by the Jarvis Engineering Company, and will be of 1,000 horse power capacity. The Jarvis boiler setting and Armington & Sims engines are used exclusively, there being of the latter four 90 horse power, one 150 horse power at present in use. L. C. Lincoln is secretary and treasurer of the railway company.

The summer residence of Montgomery Sears, at Southboro, Mass., formerly lighted by kerosene, is now supplied with an incandescent plant, including a two horse power Roper hot air engine, a 20 light Kimball & Davis dynamo, and 28 cells of the B-type storage battery of the Electrical Accumulator Company. The engine on one-half bushel coal is run the greater part of the day, and thirty 50-volt lamps are lighted the entire evening. The engine and accumulators are in a hothouse, 500 feet from the house.

The Hospital Life Building Company has accepted, through Mr. J. T. Moriarty, New England agent, the plant of accumulators in the basement of the building on State street, after a six months' trial. 120 15-a cells, in combination with a 600 light Edison plant, is operated to light the building. The use of the accumulators admitted of the entire disuse of gas, which cost, when the engines were not running, $200 per quarter. In addition, the light is perfectly steady under all variations of load and steam pressure.

The Tropical American Telephone Company have prepared and issued a new and comprehensive illustrated catalogue, in English and Spanish, of the varied instruments and central station apparatus supplied by the company. Estimates of the cost of central station for fifty subscribers and of private lines; price lists of all supplies needed in the construction of the same, and of apparatus for electrical measurement; intelligent directions for the management of batteries; descriptions (with cuts) of the proper method of constructing lines and making connections, and methods of locating and remedying faults, make this pamphlet of great value to all interested in electricity. As will be seen from the advertisement of the company, there is an exhibit of the apparatus at the American Institute Fair.

BOSTON, Mass., Sept. 27.

A Ride for the Electric Club.

At the last meeting of the Electric Club, Mr. H. D. Hall, secretary and treasurer of the Consolidated Railway Telegraph Company, extended an invitation to the members of the club to be present at an exhibition of the system of induction telegraphy on the Lehigh Valley Railroad. The date of the trip is now announced for October 6, the special train to leave from foot of Cortlandt street at 1 P. M. Tickets can be procured by members from the secretary of the club at 13 Park Row.

It is requested, so that ample arrangements can be made, that all who intend going will so inform the secretary at the earliest day possible. The occasion will be an agreeable and interesting event.

GOSSIP ABOUT ELECTRICAL INVENTORS.

Weston is closely confined to laboratory work.

Prof. Wood keeps closely at work in the factory of the American Company.

Sprague, Baxter, and Edgerton are all devoting themselves to their electric motors.

Mather is deep in the details of a new steam engine. Great things are expected here.

Phelps is developing new work constantly. Of late his electric rock drill is worthy of note.

Field's elevated railroad electric motor occupies all the time of this versatile inventor.

Stanley spends his days—and a good many nights—in his interesting laboratory at Great Barrington, Mass.

Boulton neglects not the carbon interests, and finds full scope for his energetic nature in the work of the Standard Company at Cleveland, Ohio.

Prof. Elihu Thomson, one of the youngest of the great inventors, takes intense interest in his welding by electricity—it is, in fact, one of his pets.

Slattery is reported to have resigned from the Sun Company, and cast in his fortunes with the Fort Wayne-Jenney, and will make his headquarters in New York.

Prof. Gray took great personal interest in the suit against the Bell Company, which he had hoped would substantiate his claim to being the inventor of the telephone.

Patterson, in his snug laboratory on the first floor of the large Chicago establishment of the Western Electric Company, is working out a new and improved subterranean cable.

Brush, who is recognized as one of the handsomest as well as one of the most successful, is reported to have recently improved his storage battery to his complete satisfaction.

Gilliland has been devoting his rare abilities to general electrical work in Edison's laboratory. There will be some excellent work ready to announce from this source, we dare predict.

Tesla, the Montenegrin, who appeared and disappeared so suddenly in this country, is said to be secretly at work on valuable improvements in electric lighting. He is an original and enthusiastic electrical toiler.

Prof. Bell is living quietly at Washington, occasionally lecturing before some educational gathering. The recent suits against the Bell Company apparently have caused him little worry, and he is no doubt greatly pleased over the late decision.

Eickemeyer, who made a fortune out of the invention of hat machinery, is becoming more and more imbued with the idea that great discoveries are yet to be made in electricity. His new dynamo will bear watching, for there is a good deal in it.

Lieut. Zalinski's dynamite gun is a success. We congratulate the talented inventor. The part electricity bears in this invention is most important, as it is through the use of Zalinski's battery that the explosion can be so correctly timed as to do its deadly work beneath the water.

On the forward deck of the State of Nebraska, which arrived Tuesday from Glasgow, was a yacht which is to be run by an electric motor. It is said to be the property of George Westinghouse, the patentee of the air brake, and the energetic head of the Westinghouse Electric Company.

The inventors of the induction telegraph system (with the exception of W. W. Smith) including Messrs. Edison, Gilliland and Phelps, as well as the leading officials of the Lehigh Valley Railroad, will be present on the occasion of the excursion tendered the Electric Club for next Thursday, October 6th.

The latest rumor concerning Edison is that he will erect a laboratory in California, and proceed to extract gold from the black sand to be found in great quantities in Butte county. We wish the distinguished inventor every success, and speak for some specimens of the gold thus produced—say a few thousand dollars' worth.

NOTES ON LONG-DISTANCE TELEPHONE WORK.

By E. J. Hall, Jr., before the National Telephone Exchange Association, Pittsburgh, September 26.

To talk between points hundreds or thousands of miles apart as though standing face to face is a feat, the accomplishment of which may well call for our best efforts. Apart from all commercial considerations, it presents the fascination of an unsolved problem. No sooner had the telephone exchange been an established fact than inventors and "promotors" began to suggest all sorts of visionary schemes for long-distance telephone work.

Of the early experiments, none were more successful than the trials between New York and Chicago, speech being transmitted between those points by a number of people, with fair results. These trials showed that, under certain conditions, it was possible to talk for a distance of over a thousand miles. We all know, however, that commercial business could not be carried on under these conditions, as all successful tests were made when the wires were free from outside disturbances. As they were clear only on Sundays, and even then only when there were no storms or heavy earth currents, the effect of early experiments was rather to discourage work in this direction.

In Canada and in the Western States some long lines have been operated with success, the distances covered being far in excess of any practical working lines in the Eastern States. The reasons for this have been often discussed in our conventions, and I will not go into them now; it is enough to say that, giving all due credit for what has been accomplished, no large business can ever be worked up on the basis of using grounded circuits, owing to the inevitable "cross-talk" between parallel wires. The first really practical success in talking over long distances was the copper metallic circuit constructed between New York and Boston, by Mr. T. B. Doolittle, for the American Bell Telephone Company, in 1883. The distance was about three hundred miles, and I call it the first practical success, because it was the first long-circuit that worked at all times, regardless of outside electrical disturbances.

Early in 1885 I was appointed by that company to take charge of the development of this branch of telephone service, and the American Telephone and Telegraph Co. was organized to carry on the work. At the outset it was decided that only copper wires in metallic circuits would be used, and that nothing should be spared to make the plant in every respect as perfect as we knew how to build. A builder whose work is known to you all (Mr. W. H. Fairbank) was appointed general superintendent of construction, and the first line was constructed between New York and Philadelphia. The specifications for this line required the use of poles not less than seven inches in diameter at the top and from forty-five feet upward in length; to be set six feet in the ground on straight lines and seven feet on corners or sharp curves. The poles had gains for seven ten-pin arms, and three arms were at once put on, carrying twenty-four copper wires. In addition to the copper wires, one No. 8 iron wire was strung on a top pin to strengthen the line (especially during construction). The utmost pains were taken in guying and bracing, and the good results of this care in building has been fully demonstrated by the nominal expense of maintaining the line since it was finished.

There are nearly three miles of submarine cables in this line, and all crossings are made with four seven-conductor kerite cables. In three of these cables the conductors are each composed of three No. 18½ B. W. G. copper wires, twisted together and insulated to 9-32 of an inch, and the cables are armored with eighteen No. 4 galvanized iron wires. The fourth cable has conductors of three No. 16 wires, twisted together and insulated to 10½-32 of an inch, and is armored with eighteen No. 2 galvanized iron wires. The cable houses are large, dry and well lighted, and special care was taken to guard against lightning and against bad connections and leaks in the terminals. All underground and aerial cables are of large conductors, heavily insulated, and the general result has been a line which for nearly two years has worked with uninterrupted success. Wind, sleet, lightning and electrical storms have so far passed over it without causing more than the most trifling damage, and we have secured one of the most essential elements of any factor in commercial business—reliable service.

That this line would "talk well" no one questioned, as the distance (about one hundred miles) is far within the limit which previous experiments had shown to be entirely practicable. I will say here that we have not yet reached the limit of distance, but having worked over four hundred miles we know it exceeds that. It is probable that the progress of electrical development will keep the possible limit up to the distance over which it will be commercially profitable to supply this service.

Since the completion of the Philadelphia line we have started lines of similar character between New York and Boston (250 miles), and New York and Albany (160 miles). The Boston line will be ready for service in a couple of months, and the Albany line by the end of this year.

Having completed our first line, we were at last in a position, not to commence business, unfortunately, but to work out patiently and thoroughly the problem of making these lines serviceable. Many of you will remember that at our Providence meeting, two years ago, we discussed the question as to whether there would be any serious cross-talk between metallic circuits when we had a large number of them working on the same line of poles. Opinions then varied, but the Philadelphia line showed at once that the interference between metallic circuits was practically about as bad as between grounded circuits. We determined not to offer an imperfect service to the public, and months of hard work resulted in perfecting a simple and practical method of absolutely removing all trouble from this cause. Meantime, the matter of providing suitable apparatus and methods for working metallic circuits quickly and reliably with each other and with grounded circuits at the terminal stations, was receiving constant attention, and now we are able to do this work satisfactorily, although this part of our service will always be one in which we may expect continued improvement.

As an illustration of the difficulties encountered: The repeating coil which gave excellent results when used between New York and Philadelphia, was a complete failure when used between New York and New Haven, and a long course of investigation and experiment was necessary before we discovered the cause and provided a remedy. We have completely reversed the old idea that "Anything is good enough for a telephone line;" now I would say, "Nothing is good enough;" but a friend suggests that, strictly construed, my statement makes the matter worse. At any rate the best is not too good, and I am confident that the future experience of us all will convince us, if we still doubt, that the best is emphatically the cheapest in the long run.

The telephone business has now been established long enough to bring us fully into the reconstruction period—the haste of early construction is over, and the problems of underground construction in our larger cities, the general use of cables in all exchanges, the necessity of providing improved switching facilities for the masses of wires which center in our large offices, and the complicated work of providing quick and certain means of communication between our scattered exchanges, are matters which call for the expenditure of lots of brain force and money before the "second construction" gives us a perfected system.

When we look over the history of the development of the telegraph, and see the slow and painful progress made by the pioneers of that enterprise, it may well be a matter of surprise and congratulation that the telephone has so quickly found a profitable place in the business world. To a great extent that place had been prepared by the changes in business methods wrought by the railroad and telegraph. The use of local private telegraph lines (and especially the District Telegraph service) was of especial value to us in preparing the way, by educating people in using electrical appliances for securing quick local communication.

Undoubtedly the use of the telephone has made far easier the work of introducing the electric light. This process of education is going on at a rapid rate, and the use of private leased wires between distant cities which is now so common as to be almost a necessity in certain lines of business, and the extension of our "extra-territorial" telephone lines, is preparing the way for the long-distance telephone.

I am often asked the question, "How can you expect people to use the telephone on your long lines with rates five or ten times as high as the telegraph charges?" The answer is simply this: The telephone has a field of usefulness entirely separate and distinct from that occupied by the telegraph. Of course no one will pay a dollar for a telephone message when he can accomplish the same result by sending a telegram for ten cents; neither will he pay ten cents for sending a telegram when he can accomplish the same result by sending a postal card for one cent. If the long-distance telephone competes with anything, it is with the railroad, and it does that in the same way and about to the same extent that the local telephone competes with livery stables and street cars.

As a matter of fact the service offered by the telephone is something which is entirely new and when people learn its uses its place will be just as securely fixed, as a most important factor in the transaction of business between distant points, as it now is in local service, and the railroads and the telegraph companies will not suffer any more than the livery stables and street cars do now from the telephone exchange. When people ship freight for which they are in no hurry they send it by a sailing vessel or by rail as ordinary freight; when time is of some importance it goes by steamer or by a fast freight line; when the goods are perishable or time is important, shippers send by express or by special messenger.

So when in communications time is not important, people write letters; when greater haste is necessary they send telegrams, but when time presses and there is urgent need for haste, they telephone.

When the nature of the business requires personal communication, question and answer, the railroad or the telephone line must be used, and this is our field: quick communication with instantaneous replies and prolonged personal interviews. I might give scores of illustrations, but two will suffice: A New York lawyer recently called up by telephone a lawyer in a city nearly a hundred miles away, engaged him for an important case, dictated a lot of legal papers, and inside of an hour was able to file attachments securing for his clients their interest in a large amount of property which would otherwise have been lost. This illustrates one class of service; the other is the case of the Pennsylvania Railroad, which has ample telegraphic facilities between New York and Philadelphia, but in addition, leases a private telephone circuit, so that the officers of the road can, without the intervention of operators and the delay of writing messages, carry on conversations between the two cities.

The contracts for service which we are daily making, and the emphatic commendation of business men who are using our lines, prove beyond question that the long-distance telephone is wanted and that good service will be paid for at rates which will make it profitable to supply the demand. It is just as certain that there is no demand for, and no profit in attempting to furnish poor service either in trunk lines or exchanges. Just what constitutes "poor service" is a question upon which we may not all agree. I think Mr. Jacques defined good commercial service well in a discussion of this question recently, when he said in substance that he considered a good commercial line to be one over which non-experts could converse about subjects with which they were not both familiar, without repetitions. Judged by this standard, how many exchange and toll lines would stand the test?

CHICAGO UNDERGROUND AND AERIAL CABLES.

By B. E Sunny, before the National Telephone Exchange Association, Pittsburgh, September 26.

A mile of Patterson cables has been put down in West Madison street, made up of one 150 wire cable and cables of from 25 to 125 conductors, containing in all about 200 miles of wire. No. 18 American gauge was used, and the insulation and capacity tests are very satisfactory.

These cables were put down to abandon a pole line of 90 wires built about six years ago. Notwithstanding the fact that the wires on the route were badly decayed and contained many defective connections, and that the cables were of the best manufacture, the wires on the pole route talked about twenty-five per cent. better than those in the cables.

The cross-talk is only noticeable at times, and is not heavy. These cables are laid in a box of creosoted wood, and covered with one-fourth inch tarred sheet-iron. The box is just big enough to take the cable, and no filling of any kind is used. A gang of twenty men put this cable down at a rate of 500 feet per day, finishing up everything excepting the permanent restoration of the pavement. 1,100 feet of conduit has been built to carry the cables from the present central office to the new building. The construction includes the use of wrought-iron pipe 2½ inches inside diameter, free from burs, and presenting a smooth surface to cables. The pipes, sixteen of them in all, are spread apart, and the interstices filled with concrete.

We are pulling No. 18 gauge 200 conductor cables into the pipes, and find that they work smoothly, and that a gang of six men can pull in four pieces of cable 400 feet each per day. The underground cables put down two years ago are giving satisfaction. Recent tests on some of them show an insulation ranging from five to fifteen megohms. One cable put down by the Standard Company two years ago indicated a very low insulation on the regular test. We opened the street in two or three places, and finally located the fault in a splice. No abrasion of the lead pipe could be noticed, nor was there any superficial evidence of a fault. A piece including the splice was cut out and another piece of cable put in. The piece cut out was laid on a board and shortly it was noticed that water was coming out of the splice through a blow hole the size of a pin, in the solder. There was, perhaps, half a pint of water in the sleeve. It took two years for the fault to develop. In another instance a Standard cable was cut into by plumbers some time last November. In June the insulation was found to be low, and when the fault was located, it was discovered that the water had gone into the core through a bad cut in the lead, and had worked back forty feet, requiring new cable to that extent. We have several cables, chiefly aerial, that are defective, and are being looked up It requires the constant attention of a galvanometer corps to keep them in good shape. By means of semi-annual tests, defects have been discovered and removed before they have had time to affect the service. The trouble from low insulation at the terminals is being overcome by filling the terminals with paraffine wax or some other insulator, and keeping the terminals well protected from moisture. The trouble outside of the terminals on air cables is made up of cuts in the lead by hooks cutting through, bullet holes, and careless workmen.

The following tests recently made may be of interest. Two wires were selected which ran together through nine cables of seven different styles, a distance of 4.4 miles. The cables are Patterson aerial and underground and Standard aerial and underground, and contain from fifty to one hundred and fifty wires each, ranging from 18 to 20 gauge. The resistance measures 444 ohms.

The first test was made on a day of alternate sunshine and rain, when everything was damp There was absolutely no cross-talk from one wire to the other, and conversation could be carried on freely and without any more effort than on an air line. The introduction of an annunciator drop into the circuit made no difference. A test for insulation showed 400,000 ohms for the distance, and a static capacity of 1.4 microfarads. A week later the same wires were used in the same manner with less satisfactory results. The weather was dry and warm It was found that counting on one could be distinctly followed on the other, and vice versa The cross-talk from the other wires was very noticeable, but not of sufficient vol-

ume to disturb the user. Conversation at a distance of eight inches from a fairly adjusted transmitter was indistinct and muffled. With the lips close to the transmitter, and by speaking in the usual tone of voice, the results were fairly satisfactory. This is particularly true when an air line of one and one-half miles was added. The measurements made after the test showed the insulation to be four megohms for the distance, against .4 of a megohm on the previous test, and 1.05 microfarads capacity, against 1.4. By opening one of the wires at both ends, so that all connection with the earth was removed, conversation could be freely carried on between three parties who were looped in. The first one was 5,000 feet from the open end of the cable, and the other 12,000 feet. The only difference noted by the intermediate parties in the working of the wires with the ends open was that the cross-talk was much heavier than with the grounds on. The second test indicates conclusively that we have used up all of our margin, and that a slight addition to the length of the cables will make the connection of no commercial value. In fact, in ordinary dry clear weather, conversation is only carried on by frequent repetitions, and considerable discomfort.

The nine cables included in this test are all in good condition, and with the exception of a few pieces of air cable, are new. On the above circuit there are sixteen terminals in use, but in all cases except in exchange offices the cable wires of one cable were connected with those of another at the terminals with kerite or okonite wire, so that the insulation was good at those points. The experience of four years has proven the fallacy of the practice of requiring the manufacturers to furnish a cable showing an insulation of from 300 to 800 megohms per mile. While this insulation can be secured immediately upon the completion of a cable, it is utterly impossible to maintain it. Nor is it desirable to maintain it, for the reason that cross-talk is greater on a cable with a "fancy" insulation than in one of a megohm. Subscribers always complain of cross-talk when their wires are put into a new cable, but after a few months we hear no more about it. This is not so much because they have become accustomed to the cross-talk as it is that with the lowering of the insulation the cross-talk is decreased. A better specification would be one megohm per mile, and not more than five, and a guarantee from the manufacturer that this insulation will hold up for ten years. Such an insulation exceeds anything that we are able to get on air lines. In a recent test nine wires showed each an insulation of 5.3 megohms. Rain began to fall, and in ten minutes the insulation had fallen off to 3.2, and no doubt went lower. This illustrates the extreme sensitiveness of a high insulation to moisture, and indicates clearly that where there are a large number of cables in use, the conditions are constantly varying, and nothing like uniformity in the working of the wires can be expected or secured.

Standard Daniell's Battery.

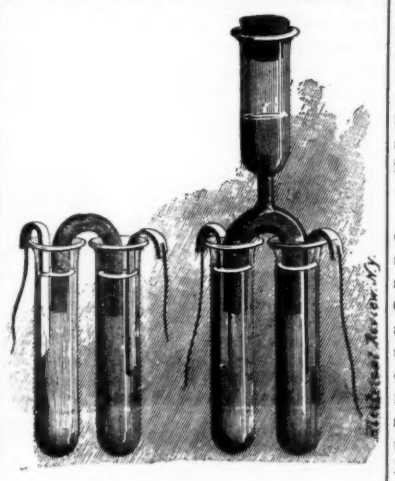
The sulphate of copper battery is probably more used as a standard of electromotive force than any other, writes T. O'Conner Sloan in *Scientific American*. Various forms have been suggested and adopted. Among the features to be secured are permanency and freedom from tendency to local action. In these and other respects the battery as usually constructed is defective, as it is emphatically a two-fluid cell. It is essential that the plates should each be immersed in a particular fluid, and that the fluids should not mix.

To secure this end various means have been adopted. The porous jar form is very commonly used. But as a scientific apparatus this is defective. The pores of the jar become filled with the battery salts, and to start new this may require quite a lengthy process of cleaning. Then it sometimes happens that metallic copper precipitates upon the surface of the porous jar, rendering it quite *hors de combat*. Thus the mere fact of the use of such a jar introduces an element of complication.

In the cut is illustrated a very simple and cheap form of cell that avoids most of the troubles usually affecting Daniell's battery. Two forms are shown, one of the simplest possible description, the other a modification designed to secure lower resistance, and admitting of the convenient use of a septum of gold-beater's skin or other membrane.

The simpler form is constructed with two test tubes, a small bent glass tube, and the plates and solutions. Two test tubes are placed in a stand. A piece of glass tubing is bent in a smooth curve, so that when in place it will extend from one to the other, as shown. This should be about 3 mm. ($\frac{1}{8}$ inch) in internal diameter. A piece of copper for negative plate, and of zinc for positive plate, are provided. To each a wire is connected by soldering. The desired solutions must now be prepared. The strength is, of course, to be fixed by the experimenter, according to the results he wishes to obtain from the battery.

The use of saturated solutions is very usual. Assuming such to be employed, one of the test tubes is nearly filled with a saturated solution of copper sulphate. The other one contains a saturated solution of zinc sulphate. The latter is the heavier fluid. The bent tube is now filled with the same solution of zinc sulphate. If it be held while thus filled with its two open ends down and open, it will not empty itself. The least jar or shake will cause it to do so; but by careful handling it can thus be carried from one vessel to another. Having then filled it with the solution, which is easily done by siphoning, it is carefully lifted up as described, and lowered into the solutions in the test tube. To be sure that no air bubbles rise into the bend, it is well to have the zinc sulphate tube filled to the higher level. Then, on introducing the bent tube, a little of the zinc solution will first siphon over and sink to the bottom of the copper solution. A slight mixing of the solutions is not prejudicial, provided no copper solution comes in contact with the zinc plate. The bent tube having thus been introduced, the copper plate is placed in the test tube containing copper



STANDARD DANIELL'S BATTERY.

sulphate solution, the zinc plate in the other tube, and the battery is ready for use.

It is of extremely high resistance, and no porous septum is used, to secure more perfectly from mixture. A slight mixing of the solutions in setting up, moreover, cannot well be avoided. The other form overcomes these troubles, and also gives a cell of lower resistance. The bent tube is made of larger diameter. It may be nearly as large as the test tubes. To the apex of its bend a capillary tube, opening into a large tube, is connected. If desired, a septum may be tied over one of its lower ends. The tubes are filled with their solutions, the bent tube is placed in position, and by suction the liquid is drawn up until it rises through the capillary tube, well into the larger one. The suction is stopped and the end left free. The liquid naturally sinks, but, owing to the small size of the capillary tube, with such slowness that a cork can be inserted, without trouble, into the suction tube. The plates are put into their places, and all is ready for use.

If a piece of memberance is used, it should be tied over the end of the tube which is immersed in the solution of higher specific gravity, containing the sulphate of zinc. It is well also, in this case, to pour into that limb through the suction tube a quantity of the zinc sulphate solution. The level of liquid in the test tubes and the length of the straight portions of the bent tubes must be so adjusted that enough liquid will be left in the test tubes after the filling of the connecting tube. To make this easier to effect, it is well to use test tubes of large diameter, or even small beaker glasses.

OUR KANSAS CITY LETTER.

(From a Special Correspondent of the ELECTRICAL REVIEW.)

A movement is on foot among the electrical manipulators in St. Joseph, Mo., to organize an electrical society for the mutual improvement of all those interested in such matters. Two or three rooms in a suitable building will be fitted up with all kinds of electrical appliances, and these rooms will be lighted and heated by electricity. Every new device and invention in this wonderful science will be closely investigated and studied. There are about thirty-five men in the city who are directly interested in the subject, and who will join the society as soon as it is organized. W. C. Stewart and J. T. Dyer are working up the matter, and a meeting of the telegraph operators and electrical workers will probably be called next week.

The Electric Lighting Company, of Springfield, Mo., which has been crowded for room, has the foundation completed for an addition twice the size of their present building, and bricklaying began the latter part of last week. The new structure, when completed, will be 50x140 feet, and front on Phelps avenue 50 feet. New machinery will be added shortly, and when all the improvements shall have been completed the plant will be worth about $75,000. At present there are 126 arc lamps, 200 incandescent and 33 street lights. "The popularity of electric lights for street purposes," says the Springfield *Leader*, "is growing rapidly among our citizens, especially in the suburbs, who would like to see many more erected. There is plenty of room in Springfield for both gas and electric lights, and the *Leader* hopes both will flourish and illuminate the dark and gloomy places in all sections of the city in the near future."

A Hastings, Neb., paper says: "The incandescent, now tried two nights, is quite satisfactory for a complete new plant and system, and will improve as used. Some 500 or 600 lights were on last night, and they threw all other means of illumination rather in the shade. Hastings is a subject for hearty and enthusiastic congratulation in view of its metropolitan step in securing this unequaled system of interior illumination. Several of the churches of the city, including the Baptist and Congregational, will be illuminated by the incandescent light."

There is a great deal of enthusiasm in Edwardsville, Ill., over the completion of the trial lamps of the Thomson-Houston electric light system. A portion of Vandalia and St. Louis streets, and about three-quarters of a mile on Main street are furnished with 2,000 candle power arc lamps, and a number of incandescent and crescent lamps are in various buildings. The lights are being erected by E. W. Mudge as an exhibition of the system, and if satisfactory to the city, the council will make the contract to light the city for five years.

A Wichita company has been here for some days, says an El Dorado, Kas., paper, trying to get permission of the city council to put in the arc and incandescent systems, free to the city, but so far has made but little headway, owing to opposition in the council. Now comes Mr. Stevens, from Boston, the bondholder of the gas company, asking the same permission. The council is perfectly safe in granting franchises to both, although the old gas company is not entitled to anything from El Dorado, as they put in about a ten or twelve thousand dollar plant, and did their best to unload it on to El Dorado with a $60,000 bonded debt. However, if a franchise will do them any good, let them have it.

Mr. James Gallagher, of the Brush Electric Light Company, Philadelphia, arrived in the city Sunday, and is arranging for an electric display exhibit at the exposition, which, it is said, will be quite unique.

The Chetopa, Kas., Electric Light Company is making substantial progress. The building for the engine and dynamos is almost ready for the reception of this machinery. A force of workmen is digging holes along the streets, in which will be planted the poles that will carry the wires. The wires, insulators, etc., are on hand; and it will not be many weeks before the white glare of electricity will lighten the city.

G. W.

Kansas City, Mo., Sept. 20.

Telephonic News

*** Kansas City, Mo., has over 2,200 telephone subscribers—a very remarkable growth. Mr. J. W. Ebert, the manager of the exchange, has been an Eastern visitor for several days past, getting points on telephone work, and attending the telephone convention.

*** Certain changes that have been decided on in the construction of the new Metropolitan Company's telephone exchange, New York, will delay the opening of the exchange for use some two or three months. The exchange is to be made for metallic circuits, and a new form of office cable used.

*** At a meeting held in this city Sept. 19th, Mr. John E. Hudson was elected president of the American Telephone and Telegraph Company, and Mr. Ed. J. Hall, jr., was elected vice-president and general manager. Mr. T. N. Vail, the former president, resigned on account of his other duties, but still remains in the board of directors.

*** The telephone line between Lawrence, Kas., and Topeka has recently been removed from along the railroad line, and now passes directly across the country, making the line several miles shorter. The principal cause of the change was on account of the great induction from the telegraph wires, which at times rendered sounds very indistinct.

*** E. B. Rhea, the agent for the Pan-Electric Telephone, who has been in Clinton, Mo., for the past few weeks, endeavoring to establish a system of his telephones there, has gone to Nevada, same State. Up to the time he left, Mr. Rhea had succeeded in getting about thirty instruments disposed of, and has left the matter to be worked up by some parties in the city.

*** The suit of the American Bell Telephone Company against William C. Turnbull, who is supposed to have made a telephone contract with the Chinese syndicate, does not seem to disturb the Philadelphia people who are interested. Mr. Wharton Barker was called upon by a reporter, but refused to say more than that the syndicate to whom the concessions had been made by the Chinese Imperial Government were not affected by the suit, so that any of their arrangements would be interfered with, and that the plans of the syndicate were altogether too well laid, and too near complete consummation, for anything short of international interference to conflict with them.

*** THE PLEASURES OF THE TELEPHONE.—Scene: A quiet and comfortable hotel in the charming hamlet of Bethlehem, amid the White Mountains. Time—Late in the evening, nearly all the guests retired for the night. The few still reading in the parlor enjoy the following telephonic wrestle: Tinkle-tinkle-tinkle. Hullo, Fred, hul-lo! Connect me with the Profile House—the Profeel House—the Profyle House. . . . Hullo! Is that you, Profile? I'm the Highland House, the *Highland House*, the HIGHLAND HOUSE, the HIGH-LAND HOU-SE, Bethlehem. Can you give Mrs Gough and friends two rooms—connected rooms?...Mrs. G-O F-F—double F—Gough. The Highland House. Mrs. Gough." (Here the telephonist banged to both the doors of the room, that he might hear the better.) "Can you give Mrs. Gough two rooms to-morrow night—connected rooms? Mrs. Gough—G O F-F." (Here the ill-suppressed titters of the listeners made a young lady of the house take an interest in the telephoner's orthography. She interviewed him. Then came:) "Oh, Mrs. Gough! Mrs. J. B. G—O—U—G—H, not G—O—F—F; Mrs. J. B. Gough. I am the Highland House. Fred, what's the matter? Mrs. J. B.—I'm the Highland House—HIGHLAND—Bethlehem. Profile House—Profeel House. Mrs. Gough—Mrs. J. B. Gough wants two connected rooms—connected—to-morrow night—if it's fine—if it's fine—if it's not raining—not wet. Mrs. G—O—F—Mrs. G—O—U—G—H and friends. I'm the Highland House. Fred—Fred"—tinkle, tinkle, tinkle—"Fred, you take this message for the Profile House."

ELECTRIC LIGHT NEWS

—— At York, Neb., a company has been granted the franchise, and will at once put in an electric light plant.

—— The American Express Company has increased its Edison plant 300 lights, the former plant being moved to the stables on 47th street.

—— The citizens of Berkeley, Cal., have formed a company to establish an electric light plant. R. P. Thomas, of the Standard Soap Works, is at the head of it.

—— Chas. J. Kintner, former principal examiner in the patent office, is soon to open in New York a branch office of Wiedersheim & Kintner, Philadelphia, Solicitors of Patents.

—— The Thomson-Houston Electric Light Company, of Atlanta, Ga., has increased its plant and has ordered another 12x12 Ball engine from the Ball Engine Company, of Erie, Pa.

—— The Edison Electric Light Company, of Salida, Col., has been incorporated with a capital stock of $12,000. The Ball Engine Company, of Erie, Pa., are to furnish the steam plant.

—— Rutland, Vt., has 55 arc lights, eight of which burn all night, and the remainder only until midnight, then not on nights when the moon should be out. The lights cost the village $6,000 a year.

—— The new pier of the Ocean Steamboat Company, at the foot of Spring street, North River, is to be lighted with 300 Edison lamps. The five steamers of this company are already lighted by the lamps of this company.

—— The Thomson-Houston and United States Electric Light companies are canvassing Black Rock, near Buffalo, to get signers for a petition to light the streets. It is understood that each company has bought a site on Tonawanda street on which they will erect a plant.

—— The Mather Electric Company will soon have finished a very complete laboratory near their extensive new factory in Manchester, Conn. In this laboratory, Prof. Wm. A. Anthony will reign supreme, and may be expected to send out valuable and reliable electrical work and information.

—— The Mayor of Easton, Penn., speaks of the electric light system of that city as follows: Our lights cost about $6,000 the first year. We have superintendent, $400 a year, engineer $50 a month, fireman $42.50, and two linemen $36 a month. We have 66 arc lights and burn them every dark night, and when there is no prospect of moonlight, and from dark to dawn. They are of 2,000 candle power. Steam is our motive power. We have three 25-light dynamos, and two 60 horse power Ide engines, 12 miles of wire, and two boilers of 70 horse power each. We have the Western Electric Company's system, of Chicago, Ill., and the entire plant cost the city $19,800.

—— Electric heat indicators are valuable means of preventing spontaneous combustion at sea. They consist of thermometers, encased and protected by iron tubes, provided, in a well-known manner, with platinum wires, and connected to a system of electric bells and indicators on deck. These thermometers are distributed among such dangerous cargo as coal, cotton, etc., liable to spontaneous combustion. Should any undue heat arise in any part of the cargo, the mercury in the thermometers will rise, make contact with the platinum wires, and give an instantaneous alarm on deck, at the same time indicating the exact spot where such dangerous heat exists.

—— The successful operation of the Ball system at Spencer, Mass., with gas engines is worthy of special notice. Three 15 horse power Otto gas engines are belted to one line of shafting, and by this two 30 light machines are driven. The steadiness of the power is noticeable and the quality of the lights is unsurpassed by that of any plant using steam power. The apparatus is owned and operated by the gas company. Estimating the cost of the manufactured gas at 50 cents per 1,000 cubic feet, the expense for power is less than in most steam plants.

—— The electric dining table in a restaurant at Sacramento is described as follows: in the room are twelve tables, with a seating capacity for sixty persons, and are all attached to the long electric motor table. Printed bills of fare are on each table and visitors order by marking on the bill, placing the same on the waiter, which is about one-half the size of an ordinary waiter, and pressing the electric button, which causes the waiter to revolve half-way around and into the long table, thence into the kitchen, where the order is filled and returned to the dining room. The arrangement is neat, noiseless, clean and comfortable, and to show with what smoothness the waiter does its work a brimming glassful of lemonade was ordered, and it was served without one drop being spilled. The table avoids all the many annoyances of restaurant dining, especially of the "sing-song waiter."

—— The annual meeting of the Consolidated Electric Light Company, of Portland, Me., held last week, resulted in the election of the following board of directors: Weston F. Milliken, William R. Wood, Franklin J. Rollins, Charles R. Milliken, Frank A. Sawyer, Portland; F. A. Gilbert, James English, H. P. Frost, New Haven, Ct.; Silas Gurney, Boston; E. H. Goff, New York. Commenting on the above, the Portland *Argus* says, editorially: "The report cannot fail to be highly gratifying reading to our citizens. The past success of the company, the careful manner in which its business has been conducted, and the energy and alertness of its managers, afford fair promise of its future prosperity. The service rendered both for public and private use has been of the highest class. The new move made—the acquisition of outside men and capital by the company to co-operate with some of Portland's best known business men—is in our opinion a further step in the advancement of one of the city's many successful business enterprises."

LAHMEYER DYNAMO.—W. Kohlrausch has recently published a discussion of 360 measurements made on a Lahmeyer dynamo. The machine is intended to furnish 60 amperes at 65 volts with 1,250 revolutions. It actually furnishes more than this. The current through the armature attained the unusual density of $8\frac{8}{10}$ amperes per square millimeter (5,300 amperes per square inch) yet without undue heating, and furnished 1,700 watts per kg. of copper (780 watts per pound). From the data given we compute the E.M.F. as about 1 volt per meter, .09 v. per m. for a velocity of 1 m. per second, and .0008 v. per m. for 1 turn per minute.

The observations have been discussed in the light of Frölich's theory, which is admirably confirmed in this machine. The author sums up his results as follows:

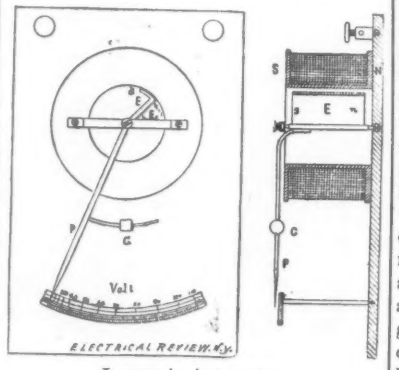
"Thorough investigation has been made of a constant potential dynamo of Lahmeyer's system, giving 3,900 watts at 65 volts. Dynamos of this system are characterized by large masses of iron (cast) and little copper, especially in the armature. They show no sensible magnetic reaction of the armature. They work with the field cores at about 37 per cent. of complete saturation. The curve of magnetism was investigated to 68 per cent. of saturation and is accurately represented by Frölich's formulæ:

$$M = \frac{\mu m i}{1 + \mu m i}$$

Frölich's constants can all be closely determined, and when introduced into the proper formulæ give a very good agreement between theory and observation. The number of turns in the series coils may be computed correctly by these formulæ."—*Centralblatt fur Elektrotechnik.*

Imhoff's Ampere and Volt Meters.

If two iron rods be suspended side by side within a vertical solenoid, it will be found that upon sending a current through the latter the rods are forced apart as far as the space within the solenoid permits. The repelling force being due to the magnetization of the iron rods in the same sense naturally varies with the strength of current, and if this force can be registered by means of a pointer on a dial, the instrument may serve to measure either currents or electromotive forces, according to the winding of the solenoid. This principle has been applied to measuring instruments both in England and abroad, one of the latest forms being that which we illustrate in the annexed sketches. The solenoid is placed horizontally, and for one of the iron rods is substituted a fixed wedge of iron E_1, whilst the place of the other is taken by a rectangular piece of sheet-iron E, the lower edge of which is pivoted in the center line of the solenoid. A current producing south polarity on the left of the solenoid produces the same polarity in both pieces of iron, which therefore repel each other. On the right north polarity is produced, thus increasing the effect, whilst the center portion remains neutral. When no current passes through the solenoid the surfaces are in the position indicated in the illustration, this position being secured by a suitable counterweight C fixed to the pointer P. When the current passes, the surfaces repel each other to a greater or lesser angle, according to the strength of the current, which is indicated on a scale, as shown. In order to cause the pointer to come quickly to rest when taking a measurement, the movable core E is bent round, forming a short segment d, which, passing



IMHOFF'S AMMETER.

close to the metal cylinder upon which the solenoid wire is coiled, acts as a damper. The inventor, Herr Ludwig Imhoff (Mülheim, Germany), claims that by this arrangement the instrument is practically rendered dead beat. By a suitable choice of the iron masses, and their distribution, a fairly even scale is obtained, and the same scale is applicable with little or no error from residual magnetism for rising and falling currents or pressures.

This is somewhat similar to the Waterhouse ammeter, which was exhibited several months ago, and which we illustrated in a recent issue.

Woman and the Telegram.

Have you ever noticed what a thing of terror a telegram usually is to a woman? In the summer time, when she is at the seaside and her liege lord is in town, this is particularly the case. As it happens now and then the dutiful husband cannot go down as usual of an afternoon, he sends a telegram to inform the fond wife that he has been detained. As soon as the messenger boy appears she begins to exhibit signs of nervousness. That her darling is dead and his partner has telegraphed her the facts, are her first conclusions, and when the ridiculousness of such a supposition is broached to her she mollifies it a trifle. Well, if he is not dead, she is sure he has had a sunstroke or an attack of paralysis, or some other horrible thing, and she must go to him at once. To open the telegram herself is quite beyond her powers. One of the children, her sister, or whoever is nearest at hand, must do it for her; and then, when she hears the true state of the case, whew! but doesn't she denounce that husband of hers for giving her such a fright? Surely, woman is as perverse as she is lovely.

An Electric Submarine Boat.

A Paris cable message to the daily *World* of this city says: "A rival to the Peacemaker and to Lieut. Zalinski's submarine Nautilus has turned up at Havre. Electricity is the motive power, and not caustic soda, as is the case with Prof. Paine's invention. It is something over eight meters in length, two deep, and of a capacity of five tons. The shell is constructed entirely of steel. The stem and stern are flush and full, but what is thus lost in speed, in the opinion of the inventor, is regained in the greater safety of navigation. The motive power is furnished by a dynamo-electric machine invented by Capt. Krebs, of the French navy, famous for his dirigeable balloons, in use now by the ballooning corps of the army. The engine has at times developed 12 horse power. The energy is stored in conservators, which contain neither lead nor acids, and which only weigh 20 kilogrammes for 1 horse power, whereas the storage batteries of the electric yacht Volta weighed 100 kilogrammes to each 1 horse power stored. The scientific men visiting the Havre Maritime Exhibition, just closed, are loud in their admiration of the new marine wonder. She has made six and a half knots for five consecutive hours during the public trials."

How We are Viewed in England.

The Saturday evening or popular lecture during the meeting of the British Association was delivered by Prof. George Forbes, F.R.S., who took for his subject "Electric Lighting." Five years ago, he said, disastrous speculation in purchasing and licensing patents at exorbitant rates paralyzed the financial community with regard to the public supply of electric light. A panic among gas shareholders, in the House of Commons and elsewhere, created, by Act of Parliament, obstacles to the new industry. At the same time crude and impossible schemes for distributing electricity, made out by incompetent persons, were tried and found wanting. The mistrust then engendered is now wholly unwarranted, and the common sense of the country must be reawakened if this nation is to take any lead in the future applications of electricity to industry and the arts. * * * * * In America the progress has been enormous, there being 250 central stations in the different towns. Arc lights in series are used largely for street lighting and for shops, and central stations for glow-lamps have been plentifully started on the parallel, three-wire and induction systems. Most of the best companies concerned pay good dividends. The total money invested in electric lighting in the United States is estimated this year to amount to £30,000,000. In 1886 there were 58 Edison central stations, supplying 149,900 lamps, besides 181,463 lamps in isolated plants. The Westinghouse Company has, during this year, been setting up central stations at the rate of 12,000 lamps per month. It is estimated that in 1885 the Brush Company alone had 96,000 arc lamps in use in the States, the number having doubled in each year from 1881. At present there are probably more than 300,000 arc lamps in use in that country. The Americans are also getting the start of us in electric railways and tramways, and generally in the application of electricity to motive power. We once beat the whole world in steam railways, and our pre-eminence in steam has gone far to make this country what it is. So let it be with electricity, for we are now passing into an age of electricity.

—— Small attachments have been levied against Postal, United Lines, American District, Commercial, American Rapid and Manhattan District telegraph companies to force them to pay expense of State Subway Commission, in proportion to their several mileage of wires in the city of New York. W. U. and B. & O. were attached for same reason some time ago, and paid under protest, as these will probably be, and the constitutionality of the commission tested in the courts.

THE TELEPHONE CONVENTION.

Pittsburgh Honored by the Presence of the Workers in this Important Electrical Field.

Special to Electrical Review.

Pittsburgh, Sept. 27.—Sunday morning saw the first of the delegates to the Telephone Convention, which convened here at 11 A. M. yesterday, and they have been arriving since. The old and commodious Monongahela House is the place of meeting, and is a very acceptable hotel for the purpose. The various localities are well represented. President Henry Metzger has accorded a pleasant welcome to all visitors, and has exerted himself to make the telephone men enjoy their first visit as convention delegates to this picturesque and at one time smoky city, now surrounded by as clear an atmosphere and as pure, fresh air as any city in the Union. The hotel is situated on the banks of the river and commands an excellent view of the surrounding scenery, which is greatly enjoyed by all the visitors here for the first time. Besides visiting the telephone exchange, a number of the delegates with electric light leanings have visited the works and offices of the Westinghouse Electric Company, and been greatly interested by what they saw.

Promptly at eleven o'clock on Monday, Sept. 26th, a goodly body of men took their seats in the spacious parlors of the Monongahela House, Pittsburgh, as delegates to the ninth convention of the National Telephone Exchange Association.

The meeting was called to order by the President, Mr. C. N. Fay, who made the following valedictorian address:

The inevitable hour has come to your president, as to every other, when he, obeying the mandate of a cruel destiny, must set in motion the machinery which shall speedily cut short his honorable, and, in his opinion, most useful official activities. No longer can he occupy that conspicuous chair or throne, from which he can say with Cicero, that "he sees the eyes of all of you to be turned upon himself;" no longer can he feel himself to be encompassed by and yet removed from among you who, to him, personify Euclid's definition of a circle, to wit, "A curved line, all points of which are equally distant from a point within called the center;" no longer will some honeyed representative of illustrated journalism beg his photograph to show the public next morning how like a prize-fighter he looks, amplifying Shakespeare by demonstrating that "one touch of art—as well as of nature—makes the whole world akin."

Alas, he must step down and out, and the utterances of another—in the next printed report of your proceedings—must be credited to that oracular article of furniture, surely carved out of the talking oak—the chair.

Pity him, therefore, and ere you receive him into your numerous but insignificant midst, grant him grace to grasp his last opportunity, to seize the one remaining hair in the forelock of Time; to bind the old fellow's wings, tip over his hour-glass, so that its hands may not run against him; and mightily to swing his scythe until naught shall remain upon the stripped harvest-field of rhetoric but endless windrows of eloquence and toppling sheaves of imagination.

After the applause which followed the President's address had somewhat subsided, the election of officers was declared to be in order.

Henry Metzger, of Pittsburgh, was nominated for president and unanimously elected, amidst loud applause. He gracefully accepted his election in a well-turned speech, which he concluded by saying "We hope your visit to Pittsburgh will be one of pleasure. "We think that we have many objects of interest in the manufactories and numerous works that line our river banks.

"It must be conceded that we are a great manufacturing city, but we have had to bear the stigma of being known as the dirtiest city in the country. This is no longer the case. We cheerfully give up to Chicago, Cincinnati and St. Louis (great objections from the St. Louisians). Oh! I supposed you would make objections, but the truth must ever be told no matter who it hits.

"We attribute this change to natural gas and we want you to see it. We have provided an excursion up the Monongahela River to-morrow, and you will be able to see the Bessemer Steel Works in full blast, using natural gas."

Mr. William D. Sargent was next elected vice-president of the Association, which honor he accepted in a few well chosen terms.

Mr. H. L. Storke, of New York, was re-elected treasurer, and R. M. Bailey of Williamsport, Pa., George N. Stone of Cincinnati, J. W. Bennett, of Lowell, Mass., and S. M. Bryan, of Washington City, members of the executive committee. Mr. E. J. Hall, jr., of New York, was chosen to fill the vacancy of the advisory committee.

The roll call by the secretary was responded to by the following gentlemen: Western Electric Co., George L. Beetle, H. B. Thayer, F. W. Harrington and C. A. Brown; Electrical Review, A. V. Garratt; Empire State T. & T. Co., Central New York T. & T. Co., H. L. Storke; N. Y. & N. J. Telephone Co., W. D. Sargent; Southern New England Telephone Co., Morris F. Tyler; American Bell Telephone Co., T. B. Doolittle, Geo. Albree, A. O. Morgan, T. D. Lockwood, J. M. Brown; Colorado T. Co., E. B. Field; N. Y. & Penn. T. & T. Co., W. N. Easterbrook; Erie T. & T. Co., J. W. Bennett, C. J. Glidden, J. W. Pickering, J. P. McKinstry and J. K. Dunbar; Central Union Telephone Co., George L. Phillips, of Chicago; Bell Telephone Co., of Buffalo, E. J. Hall; New England T. & T. Co., W. J. Denver; Southern Mass., T. Co., Samuel Ivers; Hudson River T. Co., A. B. Uline; Metropolitan T. & T. Co., J. A. Seeley; Michigan T. Co., F. A. Forbes; Chesapeake & Potomac T. Co., Samuel M. Bryan; Central Penn. T. & T. Co., R. M. Bailey; Bell Telephone Co., Missouri, Geo. F. Durant; American Electrical Works, P. C. Ackerman; Day's Kerite Co., Clark B. Hotchkiss, R. W. Pope, New York; Central District & Printing Telegraph Co., Henry Metzgar; *Modern Light and Heat*, R. F. Ross; Providence Telephone Co., A. C. White; Missouri & Kansas Telephone Co., Chas. W. McDanniel, J. W. Ebert; Standard Electrical Works, E. V. Cherry; Ohio Valley Telephone Co., H. N. Gifford; American T. & T. Co., Edward J. Hall, Jr., Angus Hibbard; Standard Underground Cable Co., of Pittsburgh, E. E. Degenhardt; Okonite Company, Geo. T. Manson; Bridgeport Brass Co., H. D. Stanley; Baker & Co., platinum dealers, Cyrus O. Baker, jr.

The Central Union Telephone Company, which two years ago resigned, was re-elected as a member and placed upon the roll.

The association now has thirty-five active, five associate and twenty-nine honorary members.

The secretary was gratified to report that the association was in a healthy and solvent condition, its expenses having been kept during the year within its income, as was seen from the treasurer's report, which was therewith submitted.

A verbal amendment was made to the constitution—October being substituted for July in line two of Article VII, in order to conform to the amendment made to Article XIV at the St. Louis meeting, fixing the time when annual dues shall be payable.

Mr. Tyler presented a brief memorial on the death of Mr. R. S. Boyd, special agent of the Bell Telephone Co., who was a victim of the terrible fire disaster at Hotel Richmond, Buffalo.

Many touching tributes of esteem and friendship were rendered in appropriate speeches by various members of the Association.

Ex-President C. N. Fay, of Chicago, then read a long and exhaustive paper entitled "Telephone Subscribers *vs.* Knights of Labor."

The session then adjurned until 2.30 p. m.

Monday Afternoon Session.

The Convention was called to order at 2.30 P. M.

The President: Mr. George L. Phillips has received since dinner the following dispatch from Mr. J. E. Hudson:

"Court this morning filed its opinion in the case of the United States against this company in this circuit and our demurrer sustained; government bill dismissed."

This announcement was received with applause, and on motion of Mr. Bennett, the president and secretary were instructed to send a telegram to Mr. Hudson, congratulating the American Bell Telephone Company "on their success in defeating the Government Pan-Electric."

Mr. E. J. Hall, jr., of New York, read his paper on "Long-Distance Telephone Work," which appears elsewhere.

Mr. Durant: I would like to ask Mr. Hall to what extent the so-called long-distance transmitter is used in supplying customers with this long distance service?

Mr. Hall: It is used altogether on our line.

Mr. Bailey: I would like to ask Mr. Hall how many poles to the mile are used on the line between New York and Philadelphia?

Mr. Hall: About forty poles to the mile is the average.

Mr. Bailey: Is there any great trouble with sleet storms through that country?

Mr. Hall: We have had two quite heavy sleet storms since the line was finished. The copper wire stood all right.

Mr. Gifford: I would like to ask Mr. Hall what changes are necessary, and if they are very great, in adapting our grounded lines or ordinary exchange lines so as to connect with this metallic circuit?

Mr. Hall: The connection between the metallic circuit and the ground line is made through a repeating coil.

Mr. Gifford: Repeating coils can be attached to the switchboard commonly in use—the multiple—and you can use the same switchboard and appliances and the necessary changes are easily made, are they?

Mr. Hall: Very easily made, yes.

Mr. Gifford: They are not expensive?

Mr. Phillips: Mr. Durant can give you some information on that point, I think.

Mr. Bailey: Are repeating coils equally practicable at each end of the line?

Mr. Hall: When the repeating coil is at one end of the line the service is very much better than when the repeating coil is used at both ends. The introduction of a second coil seems to bring in quite a serious loss. At the same time, between New York and Philadelphia, where we have good terminal lines and the instruments are in good order, there is no difficulty at all in carrying on between exchange subscribers in both cities a good business conversation. But if there is any trouble at all in the terminal line then there is difficulty. The repeating coil seems to reduce the efficiency so far that there is no margin to spare. I am speaking of using the ordinary Blake at both ends connected with the ordinary switchboard at both ends.

Mr. Fay: Suppose it failed at one point—failed at New Haven, for instance?

Mr. Hall: Well, the explanation of the failure of the repeating coil which worked on the Philadelphia line and did not work on the New Haven line, is this—I do not know whether it is absolutely correct or not, but it is a conclusion which we reached: The line between New York and Philadelphia is built largely through a low, wet country. There is a great deal of marsh land, and the line is much freer from earth currents and disturbance than the New Haven line, which is built over a rocky, hilly country, and which has either a greater number or greater intensity of earth currents, or else does not have sufficient ground to relieve the line. The effect of that was, when we put on a coil with a high static capacity, the earth currents of the metallic circuit were all carried into the grounded line, and by putting in a repeating coil with a small amount of static capacity the trouble was obviated. One little incident occurred last week that I think will prove interesting, of which Mr. Hibbard tells me, in calling up for Boston over our new line, which is now completed as far as Springfield; about 175 miles from New York the line was connected through a repeating coil on a copper wire between Springfield and Boston about 100 miles further, so that the line as made up was 175 miles of metallic circuit and 100 miles of ground wire connected through a repeating coil. The 100 miles of ground circuit was very noisy. Mr. Hibbard was for that reason unable to make the man in Boston understand what he was saying, but he was able to understand clearly every word that the Boston man said. The Springfield man, who was in on the grounded circuit, could not hear the Boston man talking to him, and Mr. Hibbard in New York talked to the Springfield man and told him what Boston was trying to say to him. The effect of the repeating coil was to screen out the noises of the grounded circuit apparently, and while the direct current which went into the metallic circuit from the Boston transmitter was not very loud, it was perfectly clear and distinct, so that he heard without difficulty everything that was said in Boston. He says that he could have carried on a long conversation, or could have taken down a newspaper article or anything of that kind from dictation. But the man who was 175 miles nearer to Boston, and on the direct circuit, could not hear Boston.

Mr. Lockwood: Mr. Gifford asked how their induction coils were made and how connected. A great many of us have had practice with those coils and know that the coil is simply an ordinary induction coil differently constructed; that is, while there are two wires, each one is alternately the primary and each one is alternately the secondary; it depends on which way the transmission is going. Each of the wires of course has two terminals or screw posts, and the two terminals of one wire are connected with the two ends of the metallic circuit, while in the other wire one screw post is connected with the line and the other with the ground terminal of the exchange line.

Mr. Seeley: Have you reference to the induction coil or repeating coil?

Mr. Lockwood: I had reference to that species of induction coil which we call a repeating coil.

Mr. Gifford: We have all had more or less trouble with bad connection, and in the last few months I think I have had more trouble with bad connection in our Louisville Exchange than I had before in eight years, and I find that some solder joints are just as bad as some of those that are not soldered—not so many of them—probably three soldered joints to one that was not soldered gave out. I would like to make an inquiry in regard to these new fangled connectors that McIntire, I think, has a patent on. They are in Newark' N. J. Those connectors are two little tubes soldered together, and you run the wires in and then twist them. I am using them and they work very nicely. I have used them only a few months. My opinion is they are going to be better than any other connections we have ever had. A good soldered connection is a good thing, but I find it is almost impossible to get a man who will go out and solder connections unless you go and stand over him with a club. If those other twisting connections will answer the purpose, why we will probably by using them get our lines built better. I would like to know if any one has used those connections and what the experience has been with them. If anybody has any information on that subject, I would be very glad to hear it.

Mr. Hall: Those McIntire connections were designed originally for our long-distance lines. Before we adopted them we had a thorough test made at the mechanical department of the McIntire joint, the Britannia joint soldered and the American twist joint soldered, the joints all being made by good linemen. Probably they were better joints than would ordinarily be made in practice, particularly as to the solder connections. The McIntire joints showed that we had the full strength of the line wire in the joints. The other joints fell off from 15 to 25 per cent. I have forgotten, now, which was ahead, but the best showed a loss of at least 15 per cent. in the strength of the line wire; that is, the break was always at the joint, and at a pull of 15 or 20 per cent. less than would break the wire itself. The McIntire joints we have used since that time exclusively, and they have given us entire satisfaction. I apply those joints to both iron and copper wire.

Mr. Lockwood: I think there may be difficulty in experience if they are applied to iron wire; that is, the conductivity may be much impaired within a few months on account of chemical action between the two metals.

Mr. Gifford: The holes of the tube fit very snugly over the wire, and it makes a very tight connection, and it is better than anything we have used. I have not soldered joints on iron wire. I used iron tubes on the iron wire, and copper tubes on the copper wire.

Mr. Seeley: I think it would be advisable if all the connections that could be gotten into the switchboard were of platinum. Steel plugs rust, brass plugs wear out very

rapidly, and platinum plugs can be made very cheap, and I think they would help the service very much.

MR. BAILEY: In the last year we have been fitting up a lot of bells with a small switch of our own manufacture, in which we use platinum points and platinum plates. We have fitted up probably two hundred to three hundred bells, and I have not found the first one to fail us yet. I think that if that was carried all the way through in switchboard connections and everywhere, it would save a vast deal of money in inspection, and give a vast deal of comfort and satisfaction in service.

PRESIDENT METZGAR expressed the hope that those who make apparatus for telephone exchanges would bear in mind the suggestions made by Mr. Seeley and Mr. Bailey.

The SECRETARY then presented a report on statistics, which will appear in the next issue of the REVIEW.

MR. SEELEY: As the gentlemen of the Convention seem to be amused at the small number of lost connections in New York, I would say that in New York when a man calls for a connection, and the party he calls for is not in his office at the time, we make a note of it, and ring him up afterward. It may possibly be twenty minutes after the call that the connection is made. If the subscriber called for cannot be raised, the operator makes a ticket which is filed on a hook. The tickets go to the chief operator, who is instructed to try and get those connections through afterward. If they succeed in getting those connections during the whole day, of course, they do not count them as lost connections.

MR. DURANT: The connection is not lost until the day is lost; it is good till sundown.

MR. LOCKWOOD: It is a realization of the old adage—"Nothing is lost if you know where it is."

MR. LOCKWOOD then read his paper entitled "Ten Years' Progress in Practical Telephony."

MR. DURANT stated that the St. Louis exchange had started at $100 a year on a three years' contract and that the rates were the same to day.

MR. BAILEY: I move that the hearty thanks of the association be tendered to Mr. Fay, Mr. Hall, Mr. Lockwood and General Barney for their able, interesting and instructive papers Carried.

MR. HALL: I want to emphasize one point that Mr. Lockwood made, and that is—that you cannot get a competent electrician for $60 a month, and I think one great difficulty with the telephone service to-day is that we have not a proper corps of men trained in the duties of their respective positions. We need better help all through the service, and it is necessary, in order to get men, to pay them. We are not training up young men in the business. The material that is coming into the telephone service is not what it ought to be to give the best results and provide the men who in the future are to fill the responsible positions in our companies.

MR. FAY: In reference to Mr. Lockwood's statement as to the effect of electro-magnets, I do not think that any member of the association can do a better thing for himself and his service than to get Van Rysselberghe's treatise on the use of electro-magnets in his simultaneous system of telegraphy and telephony over the same wire. By the use of electro-magnets and condensers Van Rysselberghe was able to diminish the effect of a Morse current upon a wire over which the current passed to such an extent that he could introduce a telephone in the same circuit and carry on conversation without being interrupted by the Morse current, although the Morse signals were passing at the same time; an effect due entirely to the retarding influence of the electro-magnet on the battery current as it came on the line. What an electro-magnet will do with a Morse current it will do with a telephone current.

THE PRESIDENT read a letter from the Westinghouse Electric Company, inviting the members to visit their works On motion of Mr. Bailey, the president was instructed to accept the invitation with thanks.

The meeting then adjourned until ten o'clock Tuesday morning.

SECOND DAY'S PROCEEDINGS.

The convention was called to order on Sept. 27 at 10.25 A. M. The secretary read letters of regret from Capt. George M. Stone, of Cincinnati, and from Mr. W. A. Jackson, of Detroit. A congratulatory telegram from Mr. George Worthington, of New York, was read. Letters of invitation to visit their respective works were read from the Oliver & Robert Wire Company, Limited; and from the Allegheny County Light Company. On motion of Mr. Eastabrook it was agreed that the thanks of the association be extended to those two companies.

The next subject taken up was the selection of a place of meeting for next year. The secretary read a letter from Mr. J. M. Bennett, inviting the association on behalf of the Erie Telegraph and Telephone Company to hold its next meeting at Minneapolis.

A letter was also read from Henry C. Davis, President of the Electric Club of New York, inviting the association to hold its next meeting in that city and tendering the full privileges of the new house of the club, No. 17 East 22d street, to the delegates in the event of the meeting being held in New York.

Messrs. Seeley, Fay, Sargent and Hall spoke in favor of holding the next meeting in New York, while Messrs. Bennett and Lockwood favored Minneapolis.

The vote resulted in the selection of New York by a vote of 14 against 10 in favor of Minneapolis The time of meeting was, on motion of Mr. Eastabrook, referred to the executive committee with power.

MR. A. V. GARRATT was then introduced by the chairman and presented an explanation of the wire gauge as endorsed by the Electric Light Association, which was followed by discussion. The thanks of the association, on motion of Mr. Bailey, were tendered Mr. Garratt "for his able discourse of the subject of gauges."

MR. SARGENT read his paper on "Underground Work," after which the convention adjourned.

TELEPHONE PERSONALS.

Mr. H. B. Thayer, manager of the New York house of the Western Electric Company, was present in all the majesty that rightly belongs to a newly-married man. He is one of the most popular gentlemen connected with the electrical business, and takes a well-earned vacation after the convention.

That noble Roman, H. L. Storke, sometimes of New York, but quite often of Albany, was present in his usual agreeable and witty humor. If honors and emoluments always went where they were deserved, Storke would have a large sized lion's share.

Col. Geo. L. Beetle was on the list, and he certainly would have been missed had he remained away.

Thomas B. Doolittle, the reliable telephone war-horse, took great delight in the scenery around Pittsburgh. He could find no wooden nutmegs or fence-rail hams, so prevalent in his State of Connecticut.

The telephone men were greatly pleased when they heard of the decision against the Government in the telephone case.

Berliner at his home in Washington is still devoting much time to electrical study and experiment, and his name as patentee is still to be seen in the *Patent Office Gazette*.

Blake is reported at work on the new long distance transmitter with a view to improvement—a difficult undertaking.

The cheery presence of Mr. Geo. L. Phillips, President of Central Union Telephone Company, was cordially welcomed. Mr. Phillips has missed several of the past conventions, through absence in Europe, but all will be forgiven if he shows up regularly hereafter.

Hon. Morris F. Tyler, of New Haven, representing the Southern New England Telephone Company, took his usual active and intelligent part in the work of the convention.

There was present the usual fine-appearing staff of special agents of the American Bell Company, several coming from quite a distance to be present at this annual reunion and exchange experiences. Several of the boys had new telephone stories, which they very generously bestowed on all victims who couldn't escape.

Secretary C. H. Barney has all along proven himself the right man for the position, and has the esteem of all the telephone officials.

President C. N. Fay came on in good time from Chicago. He is still interested in telephone work, but of late has acquired large holdings in electric lighting companies, and is president of the Chicago Company.

Mr. B. E. Sunny, of Chicago, is the same earnest telephone worker as of old, and carries with him a head full of valuable, practical data relating to operating large telephone exchanges.

Mr. E. J. Hall, jr., general manager of the Long-Distance Telephone Company, was much sought after for information concerning this important branch of the business. Being a conservative, clear-headed man, his opinion always carries much weight.

President Metzger warmly welcomed all visitors.

Mr. W. D. Sargent, of Brooklyn, found a hearty welcome awaiting him from his telephone acquaintances, all of whom were greatly pleased to find him in much better health than when at the last convention in St. Louis. Mr. Sargent's wide experience in telephone work places him in the front rank, and his views are always most attentively listened to. His experience in the all-absorbing question of placing wires underground is much sought after by the general managers of other cities.

Electrican Seeley, of the Metropolitan Telephone Company, New York, was present with his usual abundance of good spirits—social spirits is meant. Since growing a fine Italian beard, he is known as Count Seeli.

Mr. C. W. McDaniel, superintendent of the Missouri and Kansas Telephone Company, was an earnest observer of all the telephonic proceedings. Mr. McDaniels is an ingenious and practical telephone man, who has patented a number of excellent inventions.

Messrs. Hibbard, Sargent, Hall and Thayer came over on the "vestibule" train that left New York Sunday morning, and reported the ride and view of the beautiful autumn scenery as particularly fine. The time that was not devoted to looking at the landscape and drinking—water—was occupied in telephonic discussion, Thayer delivering a thesis on double-action switchboard spring-jacks, and Sargent a brilliant essay on "Electrical Life at Nassau," and Hall and Hibbard united in proclaiming that it was an easy matter to talk by telephone clear around the globe, or to the moon if a place to dig pole holes and build a metallic circuit was discovered.

Mr. W. J. Denver, the popular general manager of the New England Telephone Company, made his *debut* at telephone conventions Monday morning. He was warmly greeted, but said if he had known that Stanley, and Manson, and Baker, and some others were to be passengers on his train from New York, he would have stayed away—or come by balloon.—As it was he took an earlier train.

The absence of the big-hearted Robt. S. Boyd, who met a sad death in the Buffalo fire, was remarked with sincere expressions of regret by every regular attendant.

Petty Scandals and Chinese Grants.

What have we to do with Count de Mitkiewicz in estimating the value of the concessions given by China to an American syndicate of which Wharton Barker is the head? Whether Mitkiewicz is a real Count or a sham Count; whether he always observed the ten commandments or not; whether he was a model or objectionable husband, or whether he always paid or cheated his washwoman, are questions which have just nothing at all to do with the Chinese concessions to Americans for banks, railways, telephones, etc., nor is it a matter of moment to the public whether the real or sham Count with the unpronounceable name cheated or dealt fairly with his telephone partners.

The fact that a man flaunts a disputed or even a genuine title of nobility before the American people in business efforts, exhibits only one of the common but not highly creditable infirmities of foreigners who aspire to social, political, business, matrimonial or other success in this country; but that infirmity will not invalidate or impair an important grant made in proper form by any responsible government. Instead of discussing whether Mitkiewicz is a Count, os whether he has been saint or sinner, the only question to consider is the nature of the grant he and his party obtained. If that is genuine and in proper form from proper authority, American financial circles will not fret over sham or real titles which nobody cares for, nor will they hunt up stale scandles about individuals. They will put their money in and push civilization in China, if the grants are satisfactory, and Mitkiewicz can play Count or stableman as may please himself.—*Philadelphia Times.*

OUR ST. LOUIS LETTER.

(From a Special Correspondent of ELECTRICAL REVIEW.)

For some time past the different electric lighting companies have been patting their agents on their backs, saying at the same time, Go in and win; we will help you all in our power. So, after convincing the agent that the celebrated Fool-'em-all system of everything that is patentable under the sun in electricity is just the thing to make about ten thousand dollars clear profit the first month, he starts toward the setting sun, full of ambition to meet the opposition and carry away all orders.

But after renting suitable desk room and sending out a few hundred circulars, calculated to swell the heads of county town councils. he fails to see why it is that no inquiries are being made regarding the celebrated Fool-'em-all system; he interviews his friends, who all advise him to go further into the wilderness, and make personal solicitation, as his powers of persuasion will surely win the day. So off he goes to some point in Kansas, and registers at the Grand Palace Hotel, in Poulticeville, and proceeds to give 'em fits. After paying several weeks' board at the Grand Palace, and buying several barrels of drinks for those members of the town council who, by virtue of their past record, are supposed to be influenced by alcoholic methods, he finds his funds running low, and about all that he has left can be summed up in encouraging letters from his company's type writer, telling him that instead of delivering the machinery F. O. B., in accordance with their customary usage with agents, they will, in this especial case, pay all freights and deduct from his percentage when account is settled. After another week of cyclonic attempts to bring about an issue, he finds that the principal citizen had in years past secured a franchise for all kinds of illumination, and is willing to sell out cheap.

As the agent will lose money in case he puts up, he gently retires, and some weeks later will have the satisfaction of reading that the town has been lighted by a rival company who were not afraid to pay a salary for the purpose of exploiting their business.

The sequel is that a personal notice in an electrical paper announces that John Grayhair has severed his connection with the Fool-'em-all Electric Lighting Company.

I have tried to show how some companies attempt to do their business by letting their agents hold the bag and stand all losses.

The city has been considering for some time past the advisability of placing some arc lights on the water-works tower in North St. Louis.

The United States plant, after a lapse of several months, has started, and evidently in good shape.

For some reason or other electric plants in our public buildings do not receive the attention they deserve. Too many politicians and too few electricians tells the tale.

The exposition is in full blast—lighted by the Edison and Western Electric Companies' systems. The Western Electric Company's arc plant is a new departure with the exposition association, and will no doubt be continued as a permanent feature.

The Edison Company in Kansas City are very busy on their central station, while Mr. MacQuesten is holding down the isolated business. His last prize was a 1,000 light plant at the Sandis Flats.

Business in the State of Kansas, owing to a bad crop, is dull—the smaller towns considering that it is better to wait a while longer, and maybe do better.

The Edison Company's new 16 candle power lamp, twelve to the horse power, is creating considerable discussion, and should it prove successful will tend to revive business considerably.

ST. LOUIS, Sept. 23, 1887.

The Boston Electric Club has issued invitations to a "house warming" to be given at its club rooms Wednesday evening, October 5th.

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING SEPT. 20, 1887.

370,052 Signal and pyrotechnic electric light; Arthur C. Ferguson, Saratoga, N. Y.
370,123 Electric meter; 370,124, Manufacture of filaments for incandescing electric lights; 370,125 to 370,131, Electrical transmission of power; 370,132, Telegraphy; Thomas A. Edison, Menlo Park, N. J.
370,134 Secondary battery; Otis C. Flick, Brooklyn, assignor to the Doane and Wellington Manufacturing Company, New York, N. Y.
370,193 Adjustable support and automatic switch for telephones; Sylvanus P. Jermain, Toledo, Ohio.
370,230 Auditory transmitter for telephones; M. H. Allison, Xenia, Ohio.
370,243 Electric attachment for locomotives; Norman F. Chase, Montrose, N. Y.
370,282 Electric welding and tempering metals; 370,283, Underground conduit for electric and other railways; Elias E. Ries, Baltimore, Md., assignor of one-half to Albert H. Henderson, same place.
370,293 Telephone system; Frank C. Watkins, Philadelphia, Pa., assignor, by mesne assignments, to the United States Krotophone Company, New York, N. Y.
370,357 Printing telegraph; Robert J. Sheehy New York, N. Y.

RE-ISSUES.

10,866 Apparatus for making carbons; John T. Lister, Cleveland, Ohio, assignor of one-fourth to Mrs. E. L. Sturtevant, same place.

PATENTS.

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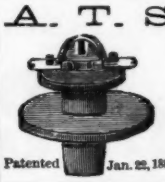

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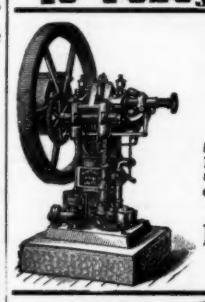

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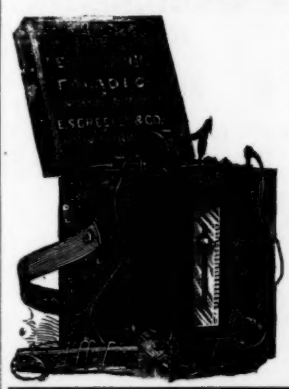

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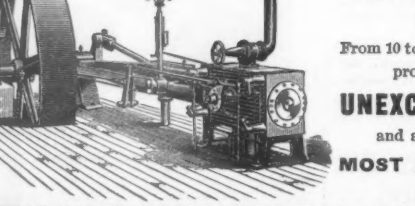

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